

NATIONALGEOGRAPHIC.COM/MAGAZINE

JANUARY 2008

NATIONAL GEOGRAPHIC

Our Grandest Canyon

WHO'S WINNING IN IRAQ 2

Genocide Unearthed 28 Return of the Lynx 56 Maya Gods and Kings 68

Arctic Hunters on Thin Ice 78 The Mighty Mantis 102

ZipUSA: "Mockingbird," Alabama 114

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Like the Canon EOS 20D, NATIONAL GEOGRAPHIC reader Nancy Bell scores big. In our recent "Focus On: Nature" contest, Bell's winning photograph of a violet-bellied hummingbird won her a Canon EOS 20D Camera Kit and a spot on a National Geographic Expeditions photography workshop in Santa Fe, New Mexico.

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Contents

Mantids—102

FEATURES

- 2** **Who's Winning in Iraq** The Kurds may be the only group powerful enough to keep Iraq from tearing itself apart. But who says that's what they want?
BY FRANK VIVIANO PHOTOGRAPHS BY ED KASHI
- 28** **Genocide Unearthed** Forensic investigators are assembling grim evidence of mass murders during Saddam Hussein's regime.
BY LEWIS M. SIMONS
- 36** **The Grandest Canyon** It's the most iconic of American landscapes, yet the Grand Canyon still has the power to surprise.
BY VIRGINIA MORELL PHOTOGRAPHS BY MICHAEL NICHOLS
- 56** **Return of the Lynx** Cats transplanted from Canada are helping repopulate the Colorado wilderness.
BY DANIEL GLICK PHOTOGRAPHS BY AMY TOENSING
- 68** **Dawn of Maya Gods and Kings** A stunning 2,000-year-old mural at Guatemala's San Bartolo site is rewriting Maya history.
BY WILLIAM SATURNO PHOTOGRAPHS BY KENNETH GARRETT
- 78** **Living on Thin Ice** As Arctic Greenland warms up, its inhabitants—both human and animal—confront a precarious future.
BY GRETEL EHRLICH PHOTOGRAPHS BY DAVID MCLAIN
- 102** **Praying Mantids** These ferocious insects are masters of disguise, outwitting their prey (if not always their predators).
TEXT AND PHOTOGRAPHS BY MARK W. MOFFETT
- 114** **ZipUSA: 36460** *To Kill a Mockingbird* isn't just a novel set in Monroeville, Alabama. It's the town's obsession.
BY CATHY NEWMAN PHOTOGRAPHS BY MICHAEL NICHOLS

DEPARTMENTS

From the Editor
OnScreen & Online
Behind the Scenes
Visions of Earth
Forum
Geographica
On Assignment
Who Knew?

Final Edit
Do It Yourself
Flashback

THE COVER

Photographer Michael Nichols perches on Toroweap Overlook in Grand Canyon National Park.

BY JOHN BURCHAM

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From the Editor



A WINTER STORM LIFTS OVER THE GRAND CANYON'S NORTH RIM. NATIONAL GEOGRAPHIC PHOTOGRAPHER MICHAEL NICHOLS

The worst nightmare of a NATIONAL GEOGRAPHIC photographer is an assignment that begins with, "You can't miss on this one." The truth is photographers can and do miss. Their challenge is to bring a fresh, imaginative eye to the assignment, particularly when it's a place like the Grand Canyon—a wonder of the world that's been photographed, painted, and filmed again and again.

We knew we had that eye in staff photographer Michael "Nick" Nichols. Nick is committed, passionate, takes creative risks, and constantly experiments with the latest technology. He's worked in some of the most dangerous and remote areas of the world, including the central African rain forest, where his work inspired the president of Gabon to create 13 new national parks.

We all think we've seen the Grand Canyon. Then a photographer like Nick comes along and shows us a new way of seeing it. He has captured the soul of this familiar landscape, in the same way he captured the soul of an unfamiliar landscape in central Africa. As usual, Nick didn't miss on this one.



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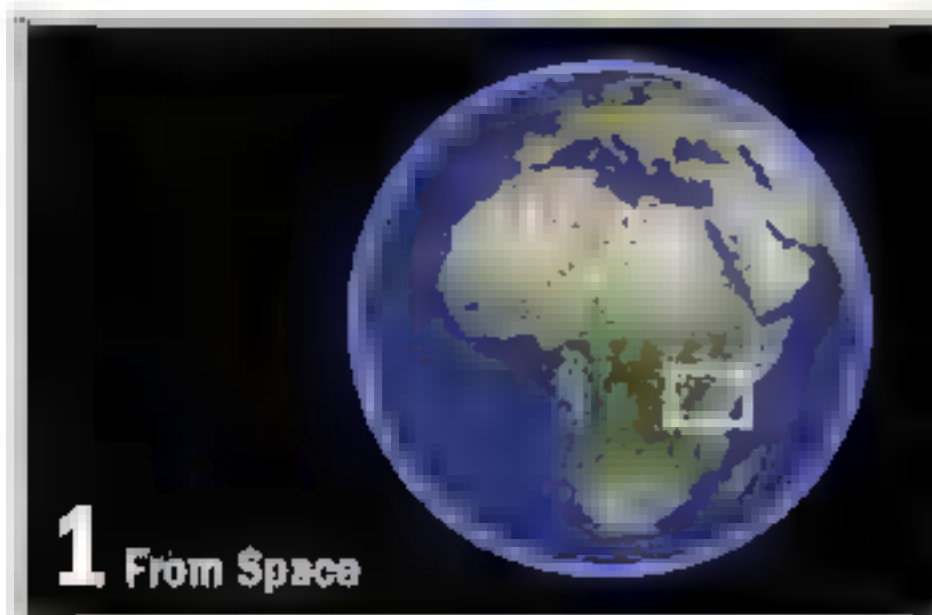


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Behind the Scenes



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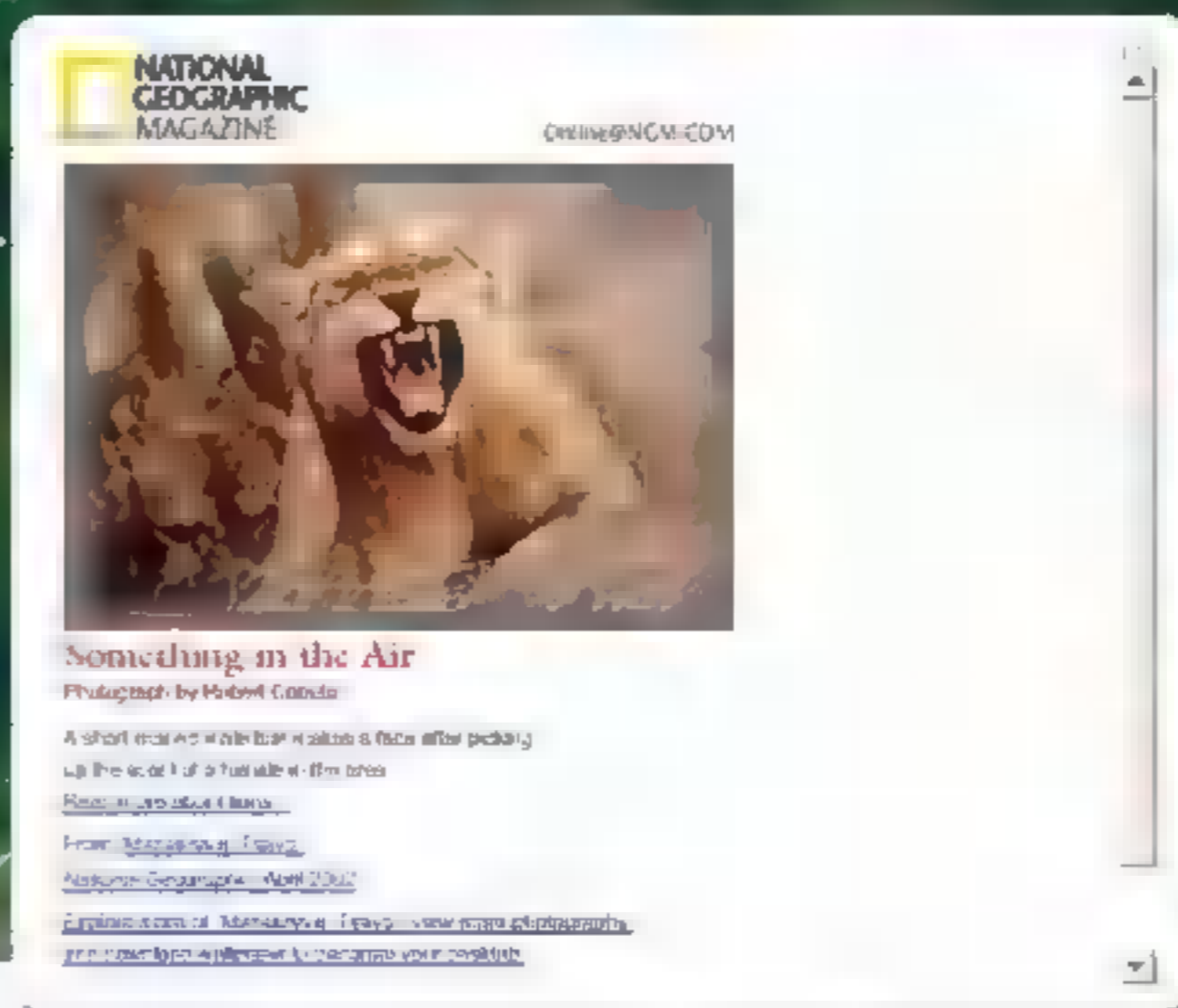
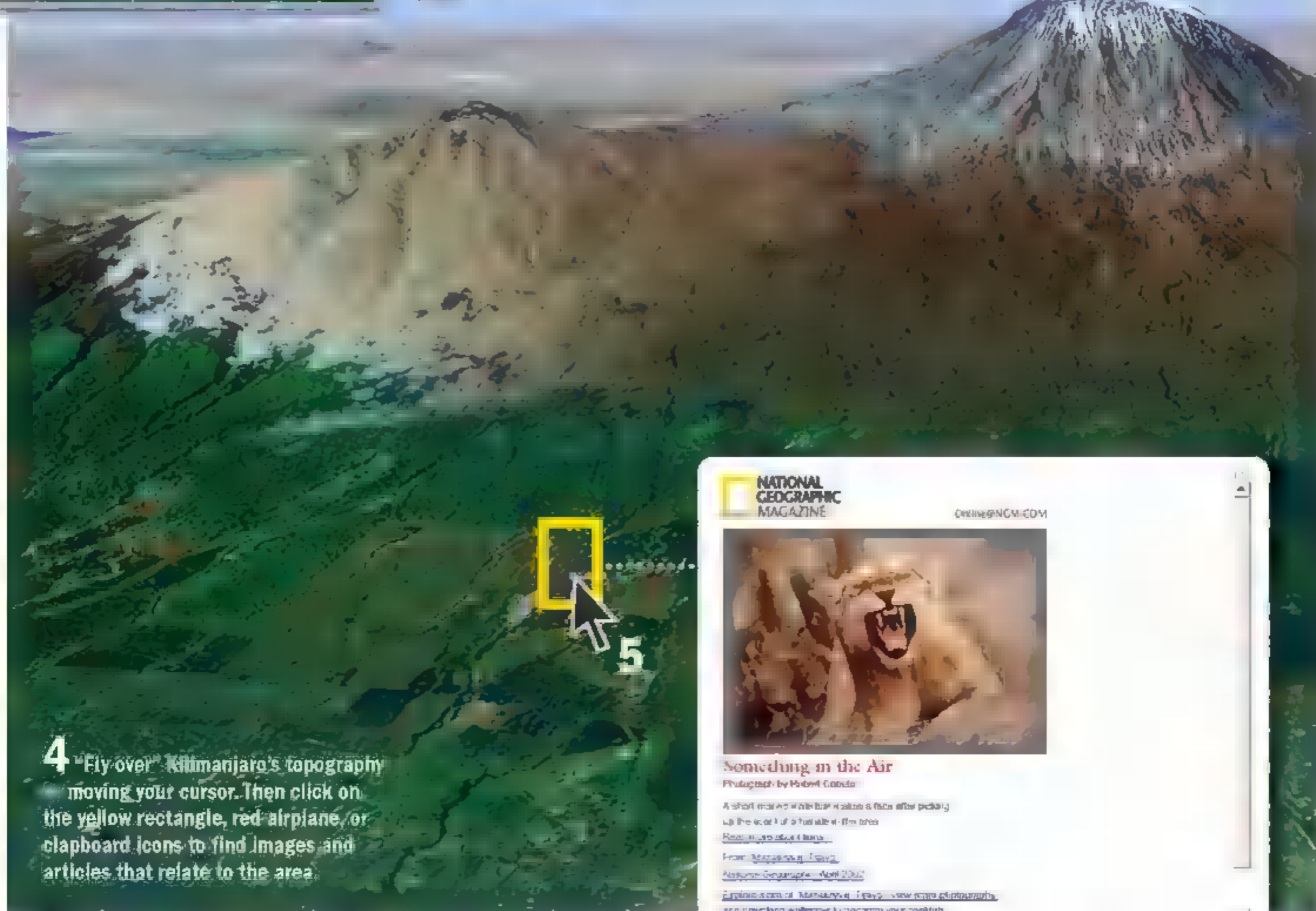
"Astronauts who see Earth from space come back as changed people," says Carnegie Mellon University mapping specialist Randy Sargent. Now the GEOGRAPHIC just might change others. With help from Sargent and his Carnegie Mellon team, the magazine has linked much of its Africa archive to 3-D satellite imagery from Google Earth. First view the planet from space (top left), zero in on a particular region (center), then click on the yellow rectangles to get even closer with links to NATIONAL GEOGRAPHIC articles, images, and online features (bottom and below) going back as far as the magazine's first article on the continent in 1889. Also included are recent dispatches and video from explorer and conservationist J. Michael Fay's Megaflyover of Africa. And that's just the beginning. In coming months the GEOGRAPHIC will expand its archives on Google Earth to offer everyone the world.

► **ZOOM IN** on the GEOGRAPHIC Africa archive and Google Earth at ngm.com.

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Visions of Earth

McMURDO SOUND, ANTARCTICA

Flying underwater At the end of the Earth, emperor penguins are in their element during the Antarctic summer ice melt. I was amazed at the birds' rocket speed as swimmers—often I couldn't keep up with them, particularly for night photography. And for about 20 minutes, they swam around me, giving me ample time to photograph them. This picture represents the exhilaration I feel when I encounter that kind of wildness head-on.

—Tim Cahill

PHOTOGRAPH BY TIM CAHILL FOR NATIONAL GEOGRAPHIC

► Decorate your desktop with this image of emperor penguins in Fun Stuff ngm.com/0601.



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Living With AIDS

Gideon Mendel, in his touching article on AIDS, gives us vision through words, and words through vision. Zamokuhle Mdingwe, at the age of seven, gives hope a name, a voice, and a face.

CATHY EDGETT
Mill Valley, California

Return to Zambia

I realized that I'd grown accustomed to the numbing effects of the bland prose of the daily newspaper and my usual repertoire of business books when I read Alexandra Fuller's recent piece in the September issue. It was a fresh reminder of the power of the artfully crafted phrase to evoke an image and fire the imagination. Elephants as battleships! Poetry!

JAY RATHERT
Richmond, Virginia

Who Rules the Forest?

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ROGER GOODMAN
Moss Vale, New South Wales

I read in the article "Who Rules the Forest?" that I am considered the hope for road improvement in the Ituri region of the Congo. This is a region that I have supported through Gilman International Conservation for several years. GIC helps local communities conserve the ecosystem and helps with their needs for

education, medical care, and clean water. Of course, there is only so much that one person can do. I currently serve on the board of the Wildlife Conservation Network, and I encourage anyone who is interested in conserving wildlife through support of local communities to get involved. There is reason for hope, and we can be that reason.

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P. M. VASQUEZ
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Jared Diamond reviews Africa's long history and its shaping by

geography with considerable accuracy and insight, but he misses two arenas. He focuses on improvement to health but neglects to relate this to the need to curb the increase in population growth. And he stresses the need for Africa to jump into the global network through technology but doesn't identify the overwhelming imperative of universal education before a technology jump can occur.

DENIS MONTGOMERY
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Accompanying Jared Diamond's article was a map titled "From Colony to Country: African Nationhood." Having recently returned from a trip to South Africa, I scanned down to find that South Africa was listed as "independent" in 1914. Although South Africa was independent from colonial powers, it was still very much controlled by Dutch and English colonists in a brutal system of government that eventually led to a terribly oppressive apartheid.

STEVEN PATRICK BLACK
Los Angeles, California

Visions of Earth

You very kindly produced a picture of an elephant passing through the reception area of a lodge in South Luangwa National Park, Zambia. The name of the property is Mfuwe Lodge. The elephants visit Mfuwe Lodge every year, creating an amazing sight for our guests to enjoy.

ANDY HOGG
*Director, Mfuwe Lodge
Mfuwe, Zambia*

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Oil Boon

The Chad-Cameroon Oil and Pipeline Project has received fairly little attention in the press. Your story is a noted exception. The Robert F. Kennedy 2004 Human Rights Award laureate, Delphine Djiraibe, has voiced the Chadian people's concerns about the pipeline project since its inception. She is now attempting to garner support for the organizations in Chad that are trying to ensure oil revenues will actually improve the lives of the Chadian people. As was expressed in the article, Chad may eventually be a "model of fairness," but this will not be accomplished without awareness of and able support for the work of organizations in Chad.

SARAH PRAY

*Robert F. Kennedy Center for Human Rights
Washington, D.C.*

In your article on oil the demon being blamed (as usual) is big oil companies. While I concur that large oil companies are not perfect—and there are examples of pollution and collaboration with corrupt governments—the real issue is that African leaders should be representing their people rather than their own families



ED KASHI

or tribes. Only when the governments truly are elected by the people and accountable to the people will the problem begin to be solved.

BILL LEONARD
Coppell, Texas

While reading about huge Chadian oil-related contracts going to government cronies and the widespread waste and inefficiency, I felt sad. I realized how much it sounds like my own country.

ROBERT BERG
La Luz, New Mexico

tribalism, paganism, and nepotism. Some have been imported, and others are homegrown. They manifest themselves in corruption, violence, and incompetence, which are more virulent than AIDS and even more difficult to combat. I fear that Africa is going to become far more ill before it becomes better.

PETER FLACK
Cape Town, South Africa

Views of the Continent

The term "bush pilots," which was used in your article on Mike

Fay and the Africa Megaflyover when referring to the Bateleurs, may cause some confusion among your readers. Bush pilots in the U.S. are adventurous commercial aviators. Pilots who join Bateleurs are businessmen, doctors, professors, farmers, conservationists, and professional pilots, and all have their own planes and many hundreds if not thousands of hours of flying time. They offer their aircraft and services to fly environmental missions free of charge. They came out in force to advise and support Mike Fay and to give him a great send-off.

NORA KREHER
*Chairperson, Bateleurs
Johannesburg, South Africa*

Inventing Nairobi

The message that comes across on pages 38-9, which carries a

photograph of my wife and myself, is to my mind misleading. It indicates that we are living the life of Riley, while sneering at Nairobi, when the truth is far from that. My wife and I have worked in Kenya and have been based around Nairobi since 1949. We raised and educated our sons here. The helicopter in the photo does not belong to our son Phil, but to a man for whom Phil flies it. I, indeed, made the facetious remark that "You can see Nairobi from here, but you can't hear it or smell it." Yet in this context, it appears as if I look upon Nairobi as a noisy, stinking place. By choice, we live in a situation where we can look across the stream at the bottom of the property and see the wildlife we both enjoy.

TERRY MATHEWS
Nairobi, Kenya

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Los Angeles, California

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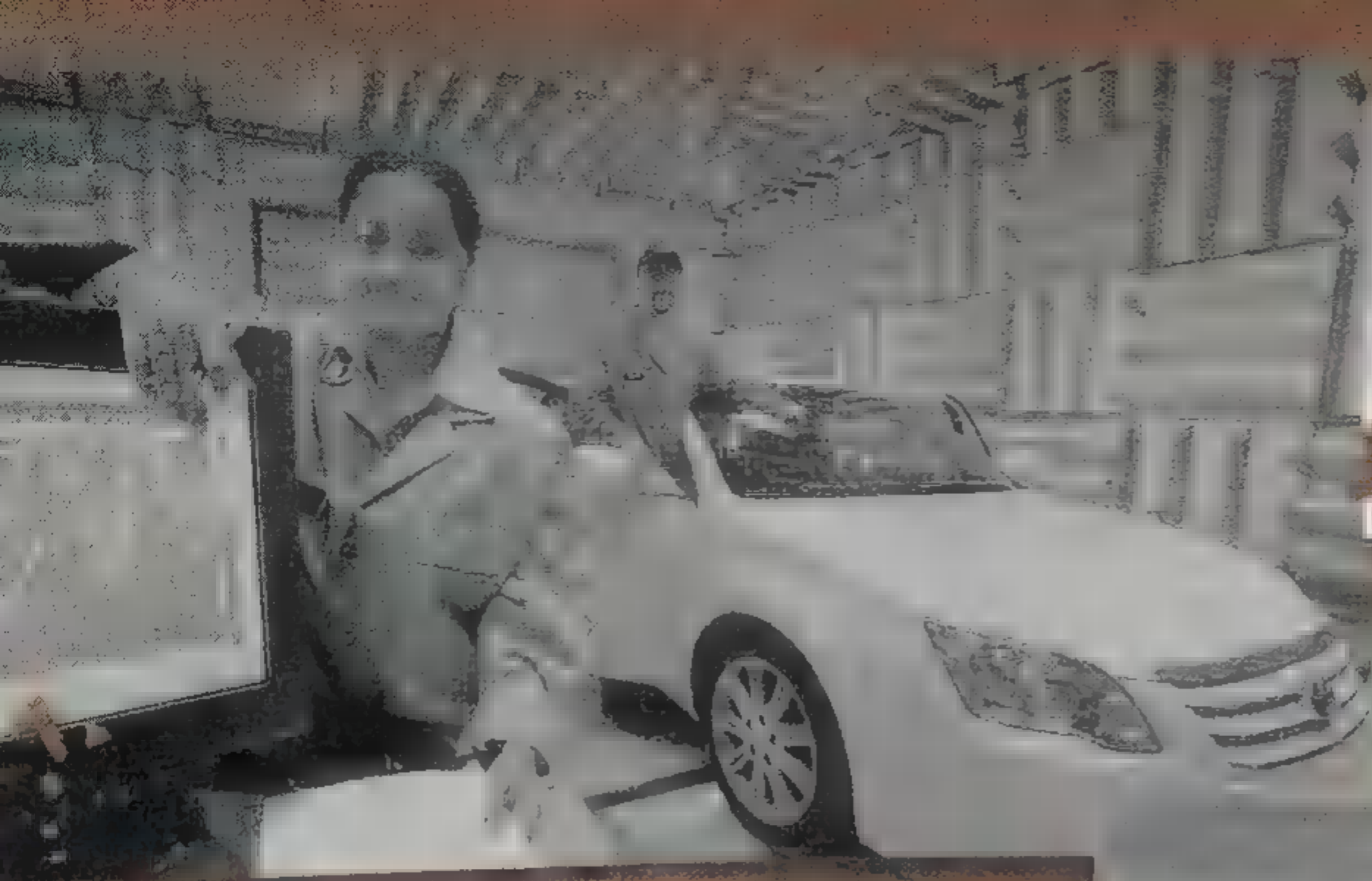
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2005 Center for Automotive Research study. Includes direct, dealer and supplier employees, and jobs created through their spending. Toyota vehicles and components are built using many U.S. sourced parts. 2005



Where we go when we go back to the drawing board.



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G E O G R

T H E P E O P L E , P L A C E S , A N D

“The last time we saw such a categorical loss was with the dinosaurs. And no one can say that didn’t change the planet.”

—JOE MENDELSON, ZOO ATLANTA

Farewell to Frogs?

Deadly fungus attacks amphibians

Scientists have known for decades that the world’s amphibian populations are in trouble. But the 2004 Global Amphibian Assessment, compiled by Conservation International and partners, held shocking news. Of the 5,700 species of frogs, toads, salamanders, and wormlike caecilians assessed, almost a third are threatened and 168 have become extinct, most in just the past 20 years. The top culprit implicated in the report, habitat loss, came as no surprise. But a lesser known offender, a recently identified disease caused by the chytrid fungus, is proving to be the most efficient killer of all.

The fungus, which invades the animals’ skins and disrupts their water balance, is running wild in the



ENDANGERED

Blue-sided tree frog, *Agalychnis annae*
Costa Rica



CRITICALLY ENDANGERED

La Selle grass frog, *Eleutherodactylus glanduliferoides*
Haiti



VULNERABLE

Salamander, *Bolitoglossa lignicolor*
Costa Rica



CRITICALLY ENDANGERED

Harlequin frog, *Atelopus varius*
Costa Rica, Panama

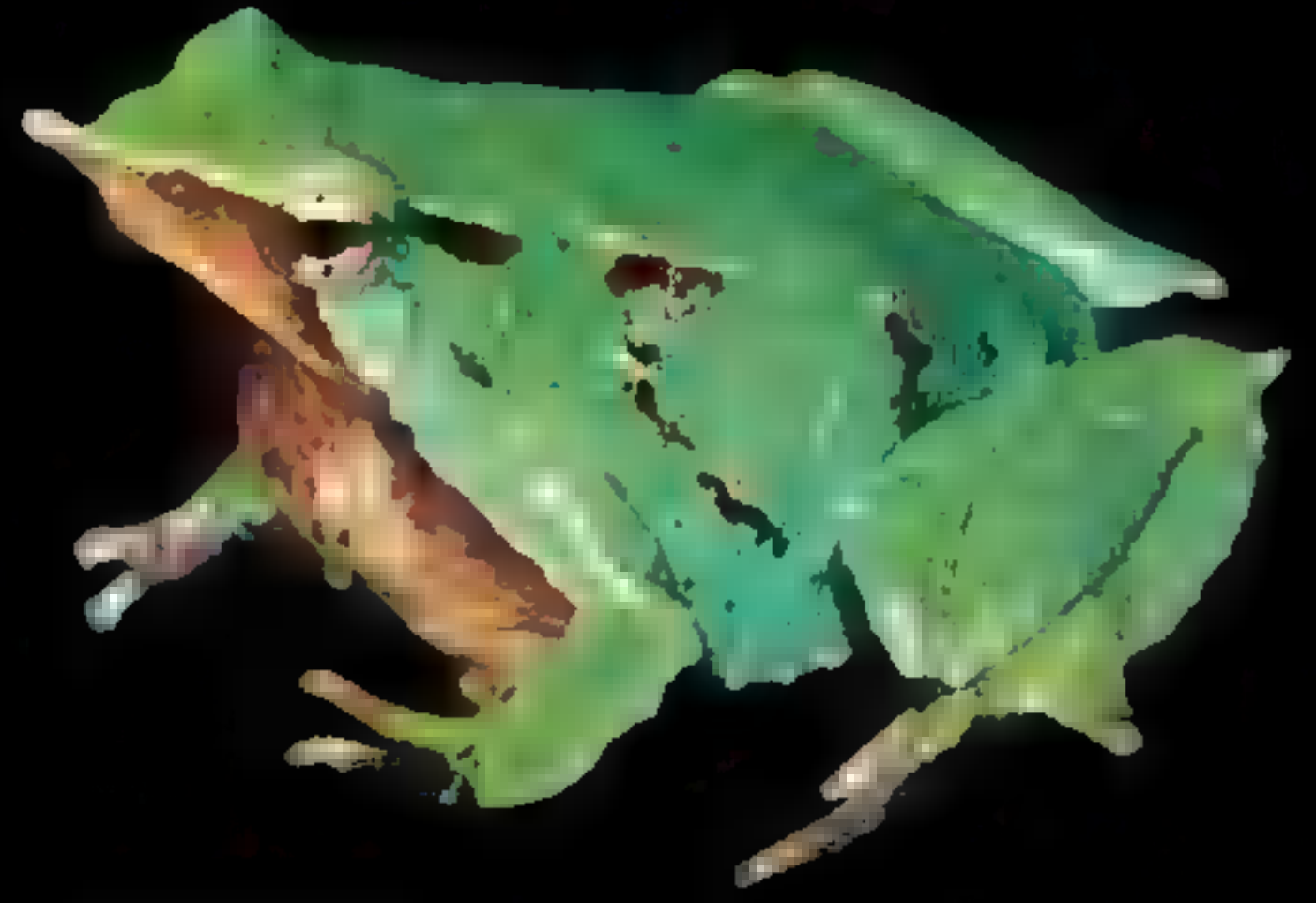
A P H I C A

C R E A T U R E S O F O U R U N I V E R S E



EXTINCT

Golden toad, *Bufo periglenes*
Costa Rica



VULNERABLE

Darwin's frog, *Rhinoderma darwini*
Chile, Argentina



ENDANGERED

Fringe-limbed tree frog, *Hyla fimbriemembra*
Costa Rica, Panama



VULNERABLE

Granular poison frog, *Dendrobates granuliferus*
Costa Rica, Panama



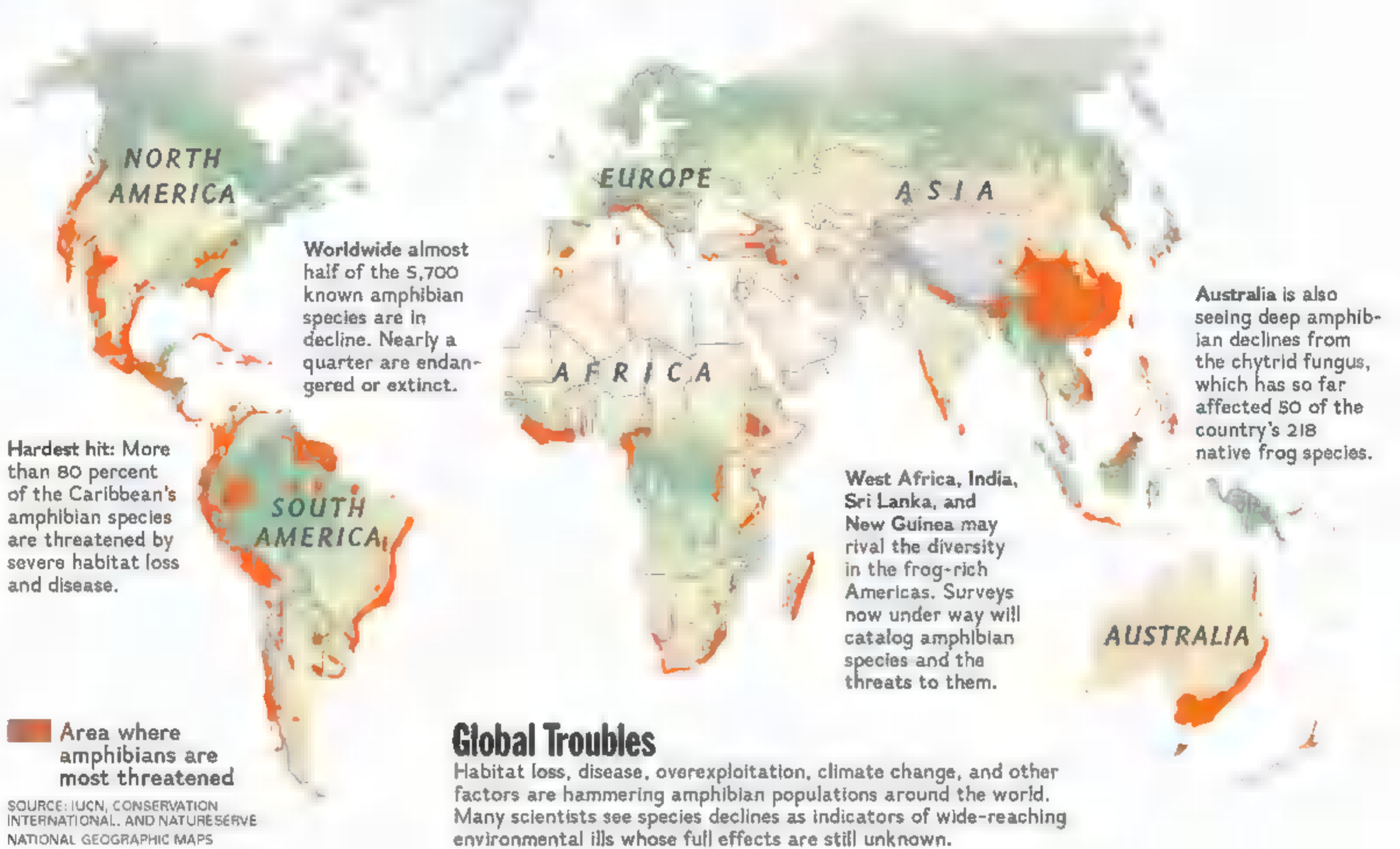
CRITICALLY ENDANGERED

Panamanian golden frog, *Atelopus zeteki*
Panama



ENDANGERED

Lemur frog, *Phyllomedusa lemur*
Costa Rica, Colombia, Panama



Global Troubles

Habitat loss, disease, overexploitation, climate change, and other factors are hammering amphibian populations around the world. Many scientists see species declines as indicators of wide-reaching environmental ills whose full effects are still unknown.

Americas and parts of Australia. "Within four months most of the 64 species of frogs here were infected or gone," says Southern Illinois University's Karen Lips of her long-term research site in central Panama. "Species we'd rarely even seen were falling out



"There are almost none left," says Karen Lips, left, of the golden frog, decimated by the fungus at her Panama study site.

of trees, bubbling up from the ground, dying from fungal disease," she says. "It's unheard of."

In an unprecedented move scientists from Zoo Atlanta and the Atlanta Botanical Garden are now racing ahead of the disease and capturing as many animals as they can to save them from extinction. "We need to put healthy frogs into zoos and other facilities while we wait this out," says Zoo Atlanta's Joe Mendelson. At Lips's Panama site, he says, "you can look down the spine of the mountain and know nothing in that line has hope. It's very sobering to make a list of what to rescue and what to leave behind, but that's all we can do." As frogs sit in refuges, scientists will seek ways to boost their immunities or neutralize the pathogen in the wild so the animals can be released.

No one knows the origin of the fungus, why it causes disease in only some species, or how to control it. Studies outside

the Western Hemisphere and Australia are few, but six continents are now known to house the pathogen. "Traditional conservation tactics like habitat protection are irrelevant here," says Mendelson. "We need entirely new thinking, or we'll lose amphibians."

—Jennifer S. Holland

How did the fungus travel?

Chytrid may have made its way around the globe aboard African clawed frogs, exported for medical research. (In the 1930s the frogs were widely used for pregnancy tests: A pregnant woman's urine injected into a frog caused it to lay eggs.) Another possible carrier: a bullfrog raised in South America and shipped live to the U.S. for its meaty thighs.

WEBSITE EXCLUSIVE Explore the fragile world of frogs at ngm.com/0105/feature6.

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Houses sit empty in Adak, Alaska, an old Navy base halfway between Seattle and Japan.

ECONOMY

A Comeback for Adak

Could a spy station be key to a town's rebirth?

Once home to a bustling Navy base, the Aleutian island of Adak, Alaska, has been a near ghost town in recent years. But Adak's hundred or so residents will soon have new neighbors, thanks to an oil-drilling platform converted to spy ware: The 26-story Sea-Based X-Band Radar (SBX) will scan northern skies for incoming missiles and could breathe new life into Adak.

Too big to pass through the Panama Canal, the 815-million-dollar rig is traveling from its Texas berth by way of Cape Horn. It should arrive in Adak's deepwater harbor this spring.

Adak's military role began in 1942 when Japan invaded the Aleutians and the U.S. used the island as a defense base. Throughout the Cold War, it served as a surveillance station with as many as 6,000 residents. The Navy pulled out its personnel in 1997, eventually ceding its facilities to

the Aleut Corporation. Since then the Aleuts, about a third of Adak's population, have been trying to rebuild. With its major seaport and airstrip Adak is an "untapped gem" says Dave Jensen, Aleut Corporation CEO. Although the SBX will employ fewer than a hundred workers, "it could provide the boost the island needs to grow."

—Eric Scigliano



Capped by its 149-foot-tall radar dome, the SBX is sailing from Texas to Alaska.

GEO NEWS

ANIMAL BEHAVIOR

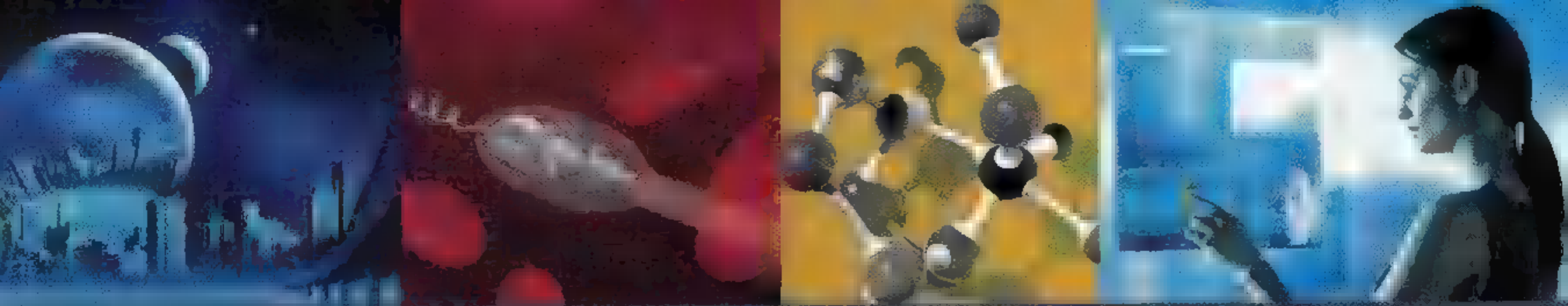
■ **A captive orca has learned to lure seagulls to his pool so he can eat them—and the trick has been picked up by other killer whales at Marineland park in Niagara Falls, Ontario.** The whales regurgitate fish onto the water's surface, then lie in wait to gulp down the fish-hungry gulls. The younger brother of the trick's inventor was the first to imitate the gull-baiting behavior. Now five whales at the park try their luck with unsuspecting birds.

GENETICS

■ **Scientists have discovered a previously unknown source of DNA.** Researchers in Israel and the U.S. found that DNA is well preserved in tiny mineral clusters known as crystal aggregates, deposited during bone formation. Their findings could be a paleontological breakthrough. Genetic material is difficult to retrieve because it breaks down over time, and human DNA is easily contaminated when handled. The clusters are expected to be especially useful for studying ancient human bones.

HEALTH

■ **Commercial airline pilots are at least three times as likely to develop cataracts** as people who don't fly for a living. The longer a pilot's career, the greater the likelihood of developing the eye condition, according to a recent study of Icelandair pilots. The researchers say that radiation from space is the cause: Aircrews receive higher doses of tiny cosmic particles than those with earth-bound occupations.



EMERGING EXPLORER ANDREW ZOLLI What will the year 2050 look like? Jets that travel from New York to Tokyo in two hours? Microscopic nanobots sent into your body to destroy cancer cells and viruses? Women in their 90s having babies? DVDs with moving previews on the box? Futures researcher Andrew Zolli scans the globe for powerful trends and creates dozens of "what if" scenarios exploring a future which is closer than you might think.

Start something visionary

"WE CAN ACTUALLY INFLUENCE THE FUTURE — choices we make today. I create scenarios to show how different choices lead to different outcomes. For example, we pick a certain approach to energy or social transformation or space exploration — 2006, then 50 years later, here's what our world will look like. It's a process of structured imagination—lots of statistical data, but lots of creativity, too. After all, the future isn't something we predict, it's something we invent based on our vision for the world. So where do we want to go?"

Andrew Zolli, Futures Researcher



The National Geographic Emerging Explorers program identifies rising talents who will make the world's next great discoveries. Recognizing the crucial role technology plays in exploration, Microsoft has supported this Program since its inception, helping an extraordinary new generation of pioneers realize their potential.



Mission Programs



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THE COLOR OF MONEY

Solid Cash

Money is big business in Switzerland—a haven for foreign investments and private bank accounts. Switzerland's financial sector contributes more than 10 percent to the nation's GDP, and the Swiss franc is one of the most traded currencies in the world. What's the secret to the Swiss success? In a word: security.

Investors covet the confidentiality of Swiss banks; they also rely on the stable economy and the strong Swiss franc. Yet feeling secure is not just about economics. "Confidence in the bank is linked to confidence in the banknote," says Werner Abegg, head of communications at the Swiss National Bank. With the help of devices such as laser-perforated numbers and special color-changing ink, the Swiss franc has become one of the most counterfeit-proof currencies in the world.

In fact, the safety features used in the current notes (right)—portraying leading Swiss figures in architecture and the arts—worked so well that they've since been employed in such items as pharmaceutical labels and official documents. This has had its drawbacks: "Widespread use of these security features makes them less unique to the bills," explains Abegg.

So Switzerland is bringing the current series of bills, only just introduced in the late 1990s, to an end. Plans are now under way to develop new, even more secure Swiss francs.

—Whitney Dangerfield

**Portrait**

Abstract artist Sophie Taeuber-Arp is the first woman to be featured on the Swiss franc.

"Têtes Dada"

Taeuber-Arp's painted wooden sculpture depicts her husband, artist Jean Arp. He was one of the founders of dadaism.

Café Aubette

These shapes represent Taeuber-Arp's interior design for a building in Strasbourg, France.

"Lignes"

Taeuber-Arp's last series before her death in 1943 dealt with the dynamics of lines and how they relate to surface and space.

Sophie Taeuber-Arp

Influential in the Zürich art scene of the 1920s, Taeuber-Arp was an abstract artist, designer, dancer, and teacher.

Kinegram One of many security features, the note's denomination—shown on metallic foil—appears to move as the bill is tilted.

Perforated numbers Only visible when held up to the light, laser-inscribed numbers border the bill.

Rectangular relief Taeuber-Arp broke new ground experimenting with compositions of rectangles and circles.



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Now's the time to catch the sleep you need. If you've been hesitant to take a prescription sleep aid, be sure to ask your doctor about Lunesta.

Important Safety Information: Be sure you have at least eight hours to devote to sleep before becoming active. Until you know how you'll react to Lunesta, you should not drive or operate machinery. Do not use alcohol while taking Lunesta. Most sleep medicines carry some risk of dependency. Side effects may include unpleasant taste, headache, drowsiness and dizziness. See important patient information on the next page.

Leave the rest to Lunesta

Lunesta™

(eszopiclone)®
1, 2 AND 3 MG TABLETS

Please read this summary of information about LUNESTA before you talk to your doctor or start using LUNESTA. It is not meant to take the place of your doctor's instructions. If you have any questions about LUNESTA tablets, be sure to ask your doctor or pharmacist.

LUNESTA is used to treat different types of sleep problems, such as difficulty in falling asleep, difficulty in maintaining sleep during the night, and waking up too early in the morning. Most people with insomnia have more than one of these problems. You should take LUNESTA immediately before going to bed because of the risk of falling.

LUNESTA belongs to a group of medicines known as "hypnotics" or, simply, sleep medicines. There are many different sleep medicines available to help people sleep better. Insomnia is often transient and intermittent. It usually requires treatment for only a short time, usually 7 to 10 days up to 2 weeks. If your insomnia does not improve after 7 to 10 days of treatment, see your doctor, because it may be a sign of an underlying condition. Some people have chronic sleep problems that may require more prolonged use of sleep medicine. However, you should not use these medicines for long periods without talking with your doctor about the risks and benefits of prolonged use.

Side Effects

All medicines have side effects. The most common side effects of sleep medicines are:

- Drowsiness
- Dizziness
- Lightheadedness
- Difficulty with coordination

Sleep medicines can make you sleepy during the day. How drowsy you feel depends upon how your body reacts to the medicine, which sleep medicine you are taking, and how large a dose your doctor has prescribed. Daytime drowsiness is best avoided by taking the lowest dose possible that will still help you sleep at night. Your doctor will work with you to find the dose of LUNESTA that is best for you. Some people taking LUNESTA have reported next-day sleepiness.

To manage these side effects while you are taking this medicine:

- When you first start taking LUNESTA or any other sleep medicine, until you know whether the medicine will still have some effect on you the next day, use extreme care while doing anything that requires complete alertness, such as driving a car, operating machinery, or piloting an aircraft.
- Do not drink alcohol when you are taking LUNESTA or any sleep medicine. Alcohol can increase the side effects of LUNESTA or any other sleep medicine.
- Do not take any other medicines without asking your doctor first. This includes medicines you can buy without a prescription. Some medicines can cause drowsiness and are best avoided while taking LUNESTA.
- Always take the exact dose of LUNESTA prescribed by your doctor. Never change your dose without talking to your doctor first.

Special Concerns

There are some special problems that may occur while taking sleep medicines.

Memory Problems

Sleep medicines may cause a special type of memory loss or "amnesia." When this occurs, a person may not remember what has happened for several hours after taking the medicine. This is usually not a problem since most people fall asleep after taking the medicine. Memory loss can be a problem, however, when sleep medicines are taken while traveling, such as during an airplane flight and the person wakes up before the effect of the medicine is gone. This has been called "traveler's amnesia." Memory problems have been reported rarely by patients taking LUNESTA in clinical studies. In most cases, memory problems can be avoided if you take LUNESTA only when you are able to

get a full night of sleep before you need to be active again. Be sure to talk to your doctor if you think you are having memory problems.

Tolerance

When sleep medicines are used every night for more than a few weeks, they may lose their effectiveness in helping you sleep. This is known as "tolerance." Development of tolerance to LUNESTA was not observed in a clinical study of 6 months' duration. Insomnia is often transient and intermittent, and prolonged use of sleep medicines is generally not necessary. Some people, though, have chronic sleep problems that may require more prolonged use of sleep medicine. If your sleep problems continue, consult your doctor, who will determine whether other measures are needed to overcome your sleep problems.

Dependence

Sleep medicines can cause dependence in some people, especially when these medicines are used regularly for longer than a few weeks or at high doses. Dependence is the need to continue taking a medicine because stopping it is unpleasant. When people develop dependence, stopping the medicine suddenly may cause unpleasant symptoms (see *Withdrawal* below). They may find they have to keep taking the medicine either at the prescribed dose or at increasing doses just to avoid withdrawal symptoms.

All people taking sleep medicines have some risk of becoming dependent on the medicine. However, people who have been dependent on alcohol or other drugs in the past may have a higher chance of becoming addicted to sleep medicines. This possibility must be considered before using these medicines for more than a few weeks. If you have been addicted to alcohol or drugs in the past, it is important to tell your doctor before starting LUNESTA or any sleep medicine.

Withdrawal

Withdrawal symptoms may occur when sleep medicines are stopped suddenly after being used daily for a long time. In some cases, these symptoms can occur even if the medicine has been used for only a week or two. In mild cases, withdrawal symptoms may include unpleasant feelings. In more severe cases, abdominal and muscle cramps, vomiting, sweating, shakiness, and, rarely, seizures may occur. These more severe withdrawal symptoms are very uncommon. Although withdrawal symptoms have not been observed in the relatively limited controlled trials experience with LUNESTA, there is, nevertheless, the risk of such events in association with the use of any sleep medicine.

Another problem that may occur when sleep medicines are stopped is known as "rebound insomnia." This means that a person may have more trouble sleeping the first few nights after the medicine is stopped than before starting the medicine. If you should experience rebound insomnia, do not get discouraged. This problem usually goes away on its own after 1 or 2 nights.

If you have been taking LUNESTA or any other sleep medicine for more than 1 or 2 weeks, do not stop taking it on your own. Always follow your doctor's directions.

Changes In Behavior And Thinking

Some people using sleep medicines have experienced unusual changes in their thinking and/or behavior. These effects are not common. However, they have included:

- More outgoing or aggressive behavior than normal
- Confusion
- Strange behavior
- Agitation
- Hallucinations
- Worsening of depression
- Suicidal thoughts

How often these effects occur depends on several factors, such as a person's general health, the use of other medicines, and which sleep medicine is being used. Clinical experience with LUNESTA suggests that it is rarely associated with these behavior changes.

It is also important to realize it is rarely clear whether these behavior changes are caused by the medicine, are caused by an illness, or have occurred on their own. In fact, sleep problems that do not

improve may be due to illnesses that were present before the medicine was used. If you or your family notice any changes in your behavior, or if you have any unusual or disturbing thoughts, call your doctor immediately.

Pregnancy And Breastfeeding

Sleep medicines may cause sedation or other potential effects in the unborn baby when used during the last weeks of pregnancy. Be sure to tell your doctor if you are pregnant, if you are planning to become pregnant, or if you become pregnant while taking LUNESTA.

In addition, a very small amount of LUNESTA may be present in breast milk after use of the medication. The effects of very small amounts of LUNESTA on an infant are not known; therefore, as with all other prescription sleep medicines, it is recommended that you not take LUNESTA if you are breastfeeding a baby.

Safe Use Of Sleep Medicines

To ensure the safe and effective use of LUNESTA or any other sleep medicine, you should observe the following cautions:

1. LUNESTA is a prescription medicine and should be used ONLY as directed by your doctor. Follow your doctor's instructions about how to take, when to take, and how long to take LUNESTA.
2. Never use LUNESTA or any other sleep medicine for longer than directed by your doctor.
3. If you notice any unusual and/or disturbing thoughts or behavior during treatment with LUNESTA or any other sleep medicine, contact your doctor.
4. Tell your doctor about any medicines you may be taking, including medicines you may buy without a prescription and herbal preparations. You should also tell your doctor if you drink alcohol. DO NOT use alcohol while taking LUNESTA or any other sleep medicine.
5. Do not take LUNESTA unless you are able to get 8 or more hours of sleep before you must be active again.
6. Do not increase the prescribed dose of LUNESTA or any other sleep medicine unless instructed by your doctor.
7. When you first start taking LUNESTA or any other sleep medicine, until you know whether the medicine will still have some effect on you the next day, use extreme care while doing anything that requires complete alertness, such as driving a car, operating machinery, or piloting an aircraft.
8. Be aware that you may have more sleeping problems the first night or two after stopping any sleep medicine.
9. Be sure to tell your doctor if you are pregnant, if you are planning to become pregnant, if you become pregnant, or if you are breastfeeding a baby while taking LUNESTA.
10. As with all prescription medicines, never share LUNESTA or any other sleep medicine with anyone else. Always store LUNESTA or any other sleep medicine in the original container and out of reach of children.
11. Be sure to tell your doctor if you suffer from depression.
12. LUNESTA works very quickly. You should only take LUNESTA immediately before going to bed.
13. For LUNESTA to work best, you should not take it with or immediately after a high-fat, heavy meal.
14. Some people, such as older adults (i.e., ages 65 and over) and people with liver disease, should start with the lower dose (1 mg) of LUNESTA. Your doctor may choose to start therapy at 2 mg. In general, adults under age 65 should be treated with 2 or 3 mg.
15. Each tablet is a single dose; do not crush or break the tablet.

Note: This summary provides important information about LUNESTA. If you would like more information, ask your doctor or pharmacist to let you read the Prescribing Information and then discuss it with him or her.

Rx only



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ON THE ROAD, IN THE FIELD,

GRAND CANYON

A Labor of Light

Taking creative risks to new heights

Toroweap Overlook was merely a warm-up for **Michael "Nick" Nichols**.

It has become a cliché," he says. "But as a photographer, you've got to work through the clichés so you can get to the good stuff." To show the Grand Canyon in a new light, Nick made a trip in

August during monsoon season, famous for violent storms. He and his assistant, **John Burcham**, stalked thunderstorms across the North Rim. At Point Sublime, Nick saw John's hair stand on end—not a good sign. They set the camera on a tripod and ran to the car. As lightning blasted

around them, Nick dashed back to retrieve his camera and was knocked flat when a bolt struck nearby. He survived, and so did some incredible images (pages 54-5). "I've always wanted to photograph lightning. I immerse myself in its light," says Nick. "This was my chance."

GOVERNMENT

C O V E R I N G T H E W O R L D

As Nick Nichols watches a storm on Toroweap Overlook, a brilliant flash of lightning triggers a device in his tripod-mounted camera: "The lightning took its own picture—and mine too."

MICHAEL NICHOLS. 103



CONTRIBUTORS



Warmed by animal skins and a ten-year friendship, writer Gretel Ehrlich joins native Greenlander Jens Danielsen for a traditional hunt by dogsled.

ICE HUNTERS

Gretel Ehrlich was on thin ice. She just didn't know it. On one of many trips to Greenland, she and native hunters Jens Danielsen and Hans Kristiansen were crossing frozen Smith Sound by dogsled. A covering of snow hid thin patches in the sea ice. Suddenly Gretel heard a loud crack. The dogs began sinking into the water, pulling the sled with them. Hans quickly lashed a sealskin line to a metal pole and anchored it into the ice with a stab while Jens struggled to rescue the frightened dogs, sinking up to his knees in frigid water. They finally hauled the sled onto solid ice and resumed their journey in silence. "Jens laid his mittened hand gently on my leg as if to say, We're OK now," Gretel recalls. "No one mentioned the trouble again."

GENOCIDE

The road from the Baghdad airport to U.S. military headquarters in the city center is only five miles. But the commute is hell. For writer **Law Simons**, that drive exposed the chaos of wartime Iraq. The threat of insurgent attack is high along the road known by luck-hungry troops as Route Irish. Travelers ride in heavily armored buses called Rhino Runners, which move under cover of darkness. "They wake you up in the middle of the night, tell you to get your body armor on, then line you up to get on the bus," says Lew, a former Marine and correspondent during the Vietnam War. "I thought, my God, if they don't control that road, they don't control anything."

IRAQI KURDS

On treacherous routes to the north, writer **Frank Viviano**

narrowly escaped the blast of a suicide bomber in Kirkuk, a city plagued by ethnic violence. The blast shook him up but wasn't his closest call with death. "I've been hit by shrapnel in Bosnia, shot down over Sarajevo, and taken prisoner by a Serb death squad in Croatia," says the veteran correspondent. Just getting around northern Iraq was a challenge. Taxi drivers took five-hour detours to avoid potential attacks in Mosul and Kirkuk. "One company had me change vehicles four times, in case we were followed," says Frank. The effort to capture the spirit of the Kurds paid off. "It was their daily insistence, against all odds, to build a normal life that really moved me."

TALES FROM THE FIELD

Find more stories from our contributors, including their best, worst, and quirkiest experiences, in Features at ngm.com/0601.

THE ADVENTURES OF JOSH BERNSTEIN

DIGGING FOR THE TRUTH

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THE AMAZON JUNGLE,
JOSH DISCOVERS THIS
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ARCHAEOLOGY

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THE HISTORY CHANNEL

History.com



Barbary Macaque (*Macaca sylvanus*)

Size: Head and body length, 45-60 cm **Weight:** Males 15-17 kg; females 10-11 kg

Habitat: Holm or cork oak and cedar forests—as well as more marginal scrub and cliff habitats—in Gibraltar, Algeria and Morocco **Surviving number:** Estimated at 10,000 in the wild



Photographed by Lynn Ruoso

WILDLIFE AS CANON SEES IT

The Rock endures; the macaque almost didn't. Barbary macaques are a well-loved fixture on Gibraltar. But by the 1940s the population had dwindled to nearly nothing and a dozen were imported from Africa in hopes of a comeback. Small groups of their descendants are still in Gibraltar today—making the Barbary macaque the only non-human primate to live in the wild in Europe. Adult males do their part to ensure the survival of the next

generation: they carry, protect and play with infants despite not knowing which, if any, are their offspring. The question is: Will this be enough to counter today's threats of habitat loss and degradation?

As an active, committed global corporation, we join worldwide efforts to promote awareness of endangered species. Just one way we are working to make the world a better place—today and tomorrow.



Who Knew?

TECHNOLOGY

The Radio Age

RFID tags are tracking everything—even you

Imagine you're looking for romance at a party full of strangers. You're nervous. Who are these people? How do you strike up a conversation? Fortunately, you're wired for social success: You've got a gizmo that beams energy at microchips in everyone's name tag. The chips beam back name, occupation,

your own skin. Passive RFID tags have a tiny antenna, but no internal energy source—batteries are not included because they're not even needed. The energy comes from the reader, a scanning device, that sends a pulse of electromagnetic energy (for example, radio waves) that briefly activates the tag.

Unlike a traditional bar code label, a tag carries information specific to that object, and the data can be updated. Already, RFID technology is used by highway toll plazas, libraries, retailers tracking inventory, and it might

Take a step back: If you were a science reporter 10 or 12 years ago, you would have heard about the coming era of ubiquitous computing (ubiquitous computing). One example always seemed to surface: Your refrigerator would know when you needed to buy more milk. The central conceit of ubiquitous computing was that computer chips could be embedded everywhere and could transmit information in a smart-gadget network that would make ordinary life simpler (because gosh knows, we are desperate for help when it comes to buying milk).

Ubiquitous computing is now commonly called pervasive computing. RFID tags are a small part of this phenomenon. "The world is going to be a loosely coupled set of individual small devices, connected wirelessly," predicts Jim Reich of the Palo Alto Research Center. Privacy advocates are nervous about the Orwellian possibilities of such technology. Tracking schoolkids through radio tags is draconian, they say. We imagine a world in which a beer company could find out not only when you bought a beer but also when you drank it. And how many beers. Accompanied by how many pretzels.

The larger lesson is that the spectrum—electromagnetic energy—is the information superhighway you've been hearing about for years. Marconi thought the radio would be used for ship-to-shore communication, not for pop music. Who knows how RFID and related technologies will be used in the future. Here's a wild guess: Not for buying milk.

—Joel Achenbach

WASHINGTON POST STAFF WRITER

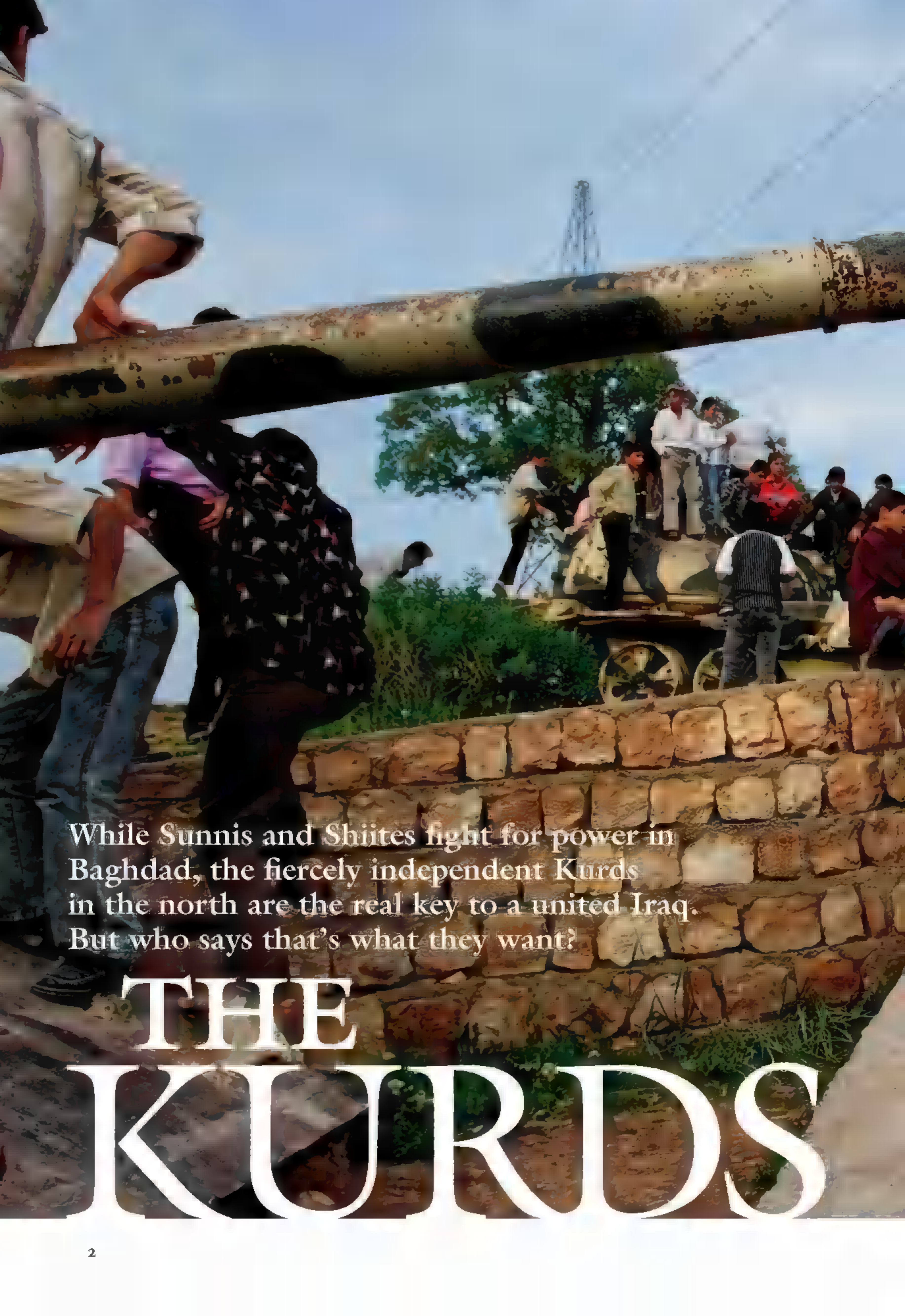


hobbies, obsessions, phobias, favorite *Seinfeld* episode, availability for a date this Friday night—whatever. Dating made simple.

This hasn't quite happened in real life. But the world is already undergoing a revolution involving RFID—radio frequency identification.

An RFID tag with a microchip can be embedded in a product, under your pet's skin, even under

appear in your passport. Doctors can implant a silicon chip under the skin that will help locate and retrieve a patient's medical records. Coroners are using the chips to keep track of Hurricane Katrina victims. At a nightclub in Barcelona—and at its counterpart in Rotterdam—the same implant gets you into the VIP lounge and pays for a cocktail with the wave of an arm.



While Sunnis and Shiites fight for power in Baghdad, the fiercely independent Kurds in the north are the real key to a united Iraq. But who says that's what they want?

THE KURDS



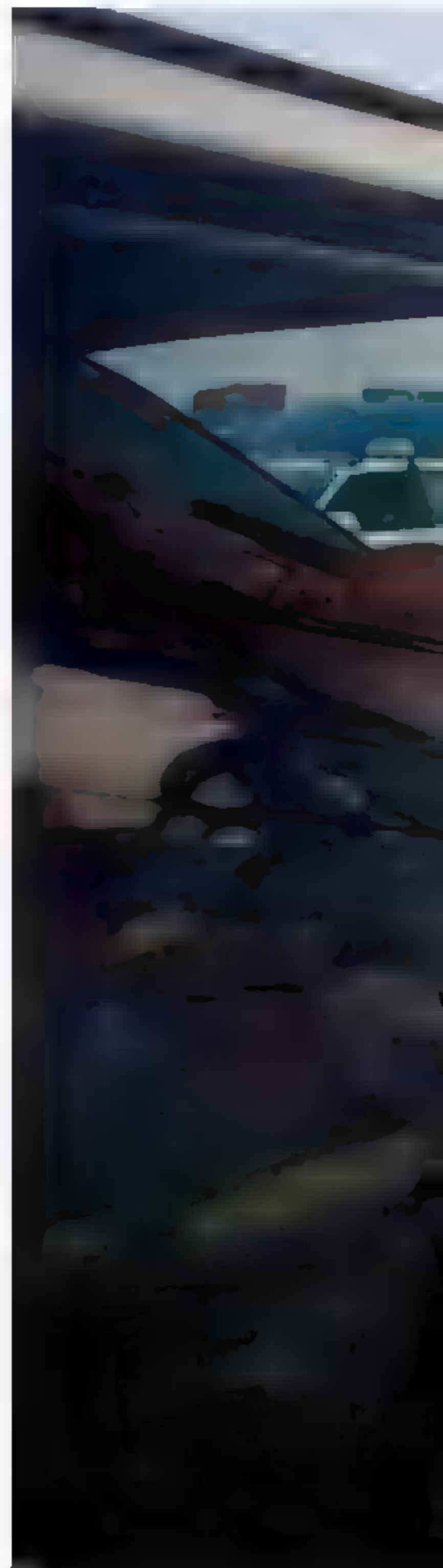
Schoolboys play on enemy tanks at a memorial to the Kurds' 1991 defeat of the Iraqi Army at Sheraswana in Iraq's Kurdistan.

IN CONTROL

BY FRANK VIVIANO
PHOTOGRAPHS BY ED KASHI

At 10 a.m. on a sweltering Tuesday morning, our death sentence was delivered by telephone. Photographer Ed Kashi and I had made the 50-mile trip from Erbil, the Iraqi Kurds' regional capital, to Kirkuk early that morning. Two Northern Oil Company officials accompanied us to the crest of a low hill. An iron red sun hung over the ancient city that Kurds call "our Jerusalem," floating in a thick haze of dust and refinery fumes. Swarms of flies rose from pungent clots of slick, stagnant water. Nearly nine billion barrels of crude lay below us. Suddenly the cell phones of both officials rang simultaneously. As they listened silently to the calls, I watched their faces tighten, noticed their eyes sweep across Ed's and fix briefly on mine. Without a word, one of them jumped into his pickup truck with a pair of their four bodyguards and sped away. The second official remained only

ALERT FOR DANGER, *Kurdish police search a car at a checkpoint near Erbil as the Arab driver—casting a shadow—stands aside. Though intense security has made the Kurds' territory safer than the rest of Iraq, several suicide bombers have slipped through in the past year.*



long enough to escort us to the company gate. “You’ve been identified as foreign journalists by a terrorist group,” he said. “Their fighters are watching us right now. Death threats have been made, and we can’t afford to be seen with you.”

He turned his head away, embarrassed. “Please try to understand. I have a family.” Then he too left with the other bodyguards.

In the agonizing half hour that followed, our panicky driver raced at breakneck speed on a zig-zag course through the Kirkuk streets. A mile short of the checkpoint where Kurdish troops manned barricades to the road north, we were brought to a halt by a traffic jam in the city’s bazaar. The cars around us were full of young bearded men who fit the classic stereotype of a terrorist.

Paranoia? Less than 24 hours later, we were within 300 yards of a suicide bomber who blew himself up on the same street.

It was the bluntest possible reminder of what northern Iraq’s Kurds see when they look to the south: a country awash in blood.

Since the aftermath of the 1991 gulf war, nearly four million Kurds have enjoyed complete autonomy in the region of Iraqi Kurdistan—protected from Saddam under a “no-fly zone” north of the 36th parallel and behind the defensive wall of the Kurds’ highly disciplined army, the *pesh-merga*. They have held region-wide elections, formed a legislature, and chosen a president, establishing a world entirely apart from Baghdad—a de facto independent state. For the first





Thrill seekers tilt and spin in a tricky test of balance at an amusement park in Duhok. Kurdish entrepreneurs built the entertainment and shopping complex on the site of an Iraqi military base, where Kurds were once tortured.

A TASTE OF FREEDOM



time in their long history, Kurds are wielding significant political power, successfully negotiating for control over their own military forces and authority over new oil discoveries in their own terrain. Under the federated Iraq being called for by the international community, they would have powers of autonomy that match—or even exceed—what they now enjoy.

But in the end, the essential Kurdish truth today is that they can't give up the dream of outright independence. After 14 years of self-rule, the Kurds can no longer imagine themselves as Iraqis. To travel through Kurdistan is to follow an intense national debate whose central issue is no longer the pros and cons of full, unambiguous separation from Iraq. It's how best to secure it. I came to think of it as a debate between Builders and Warriors.

A 13-year-old girl put the distinction into words. I met Mivan Majid in a mountain park above the city of Suleimaniya, where she was taking the evening air with her father and younger sister. To the north and east the jagged ridges of the Zagros Mountains, marking Iraqi Kurdistan's border with Iran, were receding into dusk. To the south, the immense Mesopotamian plain was a sunset-gilded carpet stretching toward Baghdad and the Persian Gulf.

I needed some air myself—we'd stopped at the park after our escape from the oil field—and I involuntarily flinched when a tall, gangly teenager in faded blue jeans tapped me on the arm.

"Hey," she said, "are you guys American?"

That's an uncomfortable question in the Middle East today, but her casual manner put me immediately at ease. She had remarkable poise and proceeded to grill me in near-perfect California slang, which she'd picked up from an expatriate girlfriend.

When I learned her age, it struck me that Mivan Majid was the Kurdish dream personified. She had never known a day under the rule of Baghdad. Suleimaniya, her hometown and the capital of Iraqi Kurdistan's eastern sector, has been under unbroken Kurdish control since 1992, the very year of her birth. She wanted to be an engineer, Mivan told me, "because they build such cool things: houses, roads, shopping centers. It's like, when you're an engineer you don't get hung up on our terrible history. You look ahead."

It's hard not to get hung up on history if you're a Kurd in Iraq. I met not a single family there that had not fled its home at some point in the past 20 years, not a single farmer who had not seen his village shelled by bombs or artillery, not a single person without a tale of chemical weapon attacks, torture, or execution under Saddam Hussein. During the infamous Anfal campaign, which peaked between February and September 1988, the Iraqi Army destroyed thousands of Kurdish villages—and killed 100,000 people.

Mivan's father joined the conversation, smiling at his daughter as she interpreted my questions and his responses. Majid Nadir was a slim, articulate man in his late 40s, with a dark, neatly trimmed mustache and penetrating hazel eyes. He had his own grim story to tell—arrest by Saddam's police in 1979 for his dissident views, followed by torture and imprisonment for a year.

The Nadirs lived just east of Suleimaniya's city center in a small stone house. It had a kitchen equipped with a wooden table and six chairs, and one bedroom shared by the two girls and their mother, Parwen. The rear of the house was occupied by a windowless living room where Mivan's five-year-old brother, Parosh, and Majid slept on a sofa and a folding cot. Majid and Parwen both worked six days a week, he as a mechanic, she as a road engineer. Fair-skinned and in her mid-40s, Parwen was a practicing Muslim, though like the majority of Kurds, she was resolutely moderate. "I'd like to go to Mecca if I can ever afford it, and make the hajj," she said. But she refused to cover her hair as many Muslim women do and shrugged when Majid described himself as indifferent to religion.

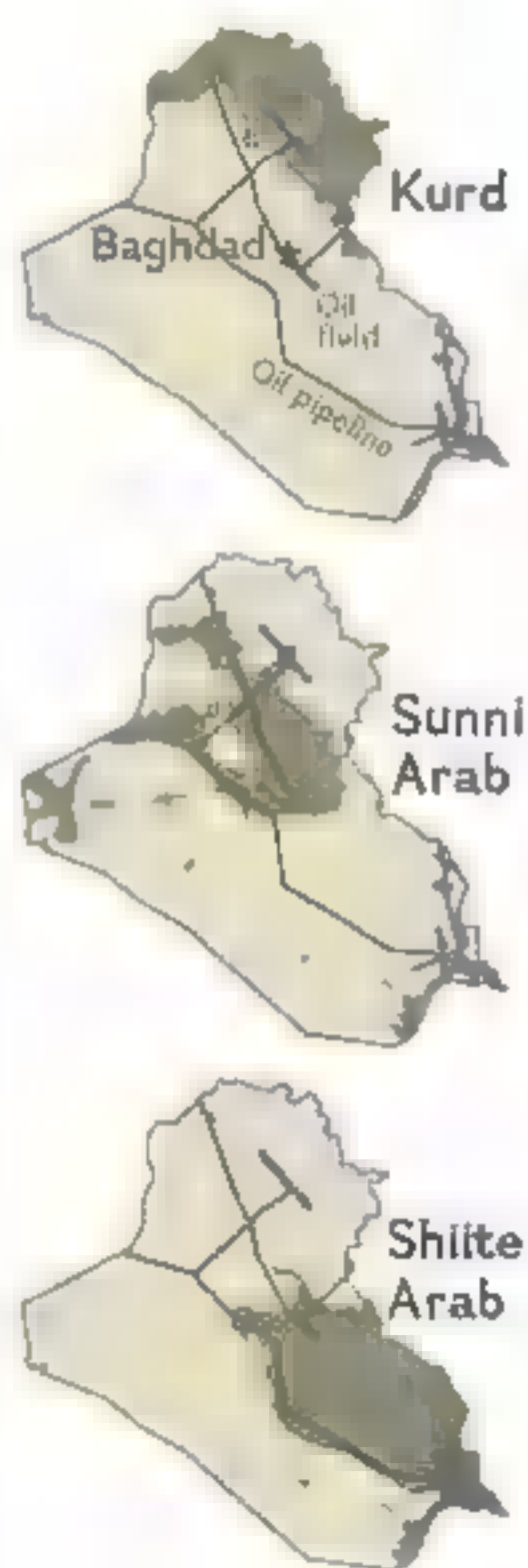
"Your own conscience is the most dependable judge of what is right or wrong, not something you hear in a mosque," he said. "If I had the money to travel, I'd use it to see Europe, or I'd go visit my brother in Hamilton, Ontario."

"My husband is a very clever guy. Do me a favor and take him to the U.S.A. with you," Parwen said, slapping Majid on the arm. They both laughed. In Kurdistan it's not unusual for women to speak their minds—or serve as military officers, government ministers, and engineers, like Parwen, presiding over men at construction sites. "What matters here isn't whether you are a man or a woman," Parwen said. "It's getting the job done well."

Getting the job done, whatever the sacrifice



RISING POWER IN THE NORTH Since 1991, the Kurds of Iraq have controlled an autonomous region in the mountainous north. Today they are intent on expanding that freedom under a new constitution that calls for a federated state, demanding control of traditionally Kurdish areas, such as oil-rich Kirkuk, that fall outside the de facto border. Kurdish soldiers—who once fought Saddam’s army—now train (below) as part of Iraq’s national army.





Signs of a growing economy enliven a street in Erbil, one of the Kurds' three main cities. With much of Iraq still in turmoil after the U.S. invasion in 2003, foreign companies are doing business here—attracting shoppers from all over the country.

DIVIDENDS OF PEACE



نوتیلا
سه روزش



بهر جا فکیت ماکنس
تیلوم ب بیکرنا
بهر جا فکیت بوزد اریس

سوزگار
خالد نواف
استودیو نه هو هیئت زادیگا
و اختصاصی بیله الا طهار

ساخته علی الاستیسان
بهر جا فکیت ماکنس

ZER
IRAN MARKET

Tipton

FOREVER

بهر جا فکیت ماکنس

دست با

MIVAN MAJID is the Kurdish dream personified. Her hometown has been under unbroken Kurdish control since 1992, the very year of her birth.

was manifestly the Nadirs' child-raising philosophy. They'd carefully budgeted for the computer equipment and books, in English and Kurdish, that filled one wall of the living room. Money had also been set aside for a larger home, closer to the private high school that Mivan attended, and that her ten-year-old sister, Avin, and Parosh were expected to attend in turn. Everything about their family life spoke eloquently of hope and aspiration. "I want to build things, like my mother," Mivan had said on the mountain.

At every turn in Kurdistan, I heard that word "build." I heard it from men like Majid, who'd had their fill of violence. It had the quality of a mantra among the young: "You can't build a nation with weapons," said Ranja Tahir, 20, an economics major at Suleimaniya University. And it was an outright article of faith among women. Even among women such as Feiza Majid Talabani, the Mata Hari of Kurdistan.

Feiza was an unlikely spy. Short, a bit round, and gregarious, she had jogged over to introduce herself at a peshmerga female officers' training base. We chatted while her fellow trainees fired practice rounds of rocket-propelled grenades.

She had been infiltrated into Kirkuk early in the 2003 war to unseat Saddam, a 25-year-old disguised as a fragile elderly woman, with a cell phone and miniature camera hidden under her robes. For a month, until the city fell under a joint Kurdish and American attack, she provided daily reports on Iraqi Army troop movements.

I asked if she'd been frightened. "We all only die once," Feiza answered, "and if you're a Kurd, death is near every day."

It was a Warrior's response—in Kurdish, peshmerga means "those who walk before death"—and I expected the rest of our conversation to be in the same militant vein. I was wrong. "You have to understand, I didn't join the army because I want to shoot people," she said. "It's because I believe women bring a different idea to an army's purpose. Women are builders, not destroyers. Building, that's what needs to be done now."

Building is what Iraqi Kurds have been doing, across the protected zone, in an orgy of urban expansion. The unmistakable effect, as one Kurdish official put it, is "facts on the ground," a separate Kurdistan so complete in its physical weight—and institutions—that its existence is a *fait accompli*.

Kurdish cities like Suleimaniya, and Erbil in the western sector, are mazes of unmapped, cement-choked streets lined with cranes and half-finished apartment blocks. Majid Abdulrahman, the harried director of housing for Erbil, estimated that the money spent on residential building in 2005, valued in dollars, will be 40 times the level in 1996. When I asked what Erbil's population might be, he shook his head: "I have absolutely no idea." He added that he had no city plan for Erbil in his office. "If such a thing exists, and I doubt it, I've certainly never seen it. I'd refer you to the ministry of planning, but we don't have one."

The outskirts of the city are a patchwork of shantytowns, swollen with refugees from outside the protected zone, where a third of Iraq's Kurds still live. Their streets chart an unintentional time line of human lodging, recording the march from mud-walled huts to cinder-block bungalows to two-story villas; each mutely declares how long each family has resided there, adding handmade bricks and tar-paper roofing, piece by piece, year by year.

In what was once a low-rise residential neighborhood next to Erbil's central market, a six-million-square-foot commercial plaza, the City Centre Project, was rising. Its architects foresee 6,000 shops and other businesses in the one-billion-dollar complex, which is to include four 30-story office towers.

Scratch the surface of Kurdistan's building boom, however, and it's clear the prosperity is mostly veneer. Apart from the construction itself, Kurdistan has virtually no industry. From 1996 to 2003 money flowed into the region under the UN's controversial oil-for-food program, which



UNDER THE EYE of her father, 13-year-old Mivan Majid chats in English, peppering her conversation with American slang. At her brother's birthday party, Mivan readies the cake with help from her friend Sarah, in yellow, whose parents took her to safe haven in Germany for ten years. Mivan's parents chose to stay in Iraq, working extra jobs to pay for her private school in Suleimaniya. Mivan's dream? "I want to be an engineer to help rebuild my country."





IN A STIFLING STOREROOM rented as living space in a refugee camp near Erbil, 13-year-old Rebaz Malla Muhammad Amin, at center, shares a dinner of rice with his older brother and father, a widower. Fleeing Iraq's violence in 1997, the family settled briefly in Iran, where Rebaz received rudimentary schooling. Now he collects recyclables by donkey cart (below) and resells them to earn money for rent and food. Rebaz's dream? "I'd like to go back to school."



allowed Iraq to export oil and purchase flour, rice, milk, and other staples. That money has now dried up. Meanwhile the program stunted the region's once healthy agriculture: There was no reason for Kurdish farmers to keep raising wheat in competition with handouts.

Kurdish expatriates who have come back to their homeland since Saddam's fall are undoubtedly a force behind modernization. They arrive by the hundreds each month, carrying suitcases stuffed with euros, dollars, and pounds—along with foreign habits, attitudes, outlooks, and expertise they've acquired in exile.

Yet every government official and businessperson I spoke to was at a loss to specify the returnees' numbers or pinpoint where the bulk of the construction money might have come from. Its origins were too piecemeal for accurate monitoring, had monitoring of any kind been possible in cities without planning departments, maps, or population figures.

Nor in mid-2005 did northern Iraq have credit cards, banks, or conventional channels for major overseas investments. Until very recently, investors, like all other visitors, were obliged to take taxis across the dangerous Turkish or Iranian borders, the main entry points to Iraqi Kurdistan, with wads of cold cash in their baggage. The situation eased only slightly late last year, when Kurdistan Airlines was launched and introduced twice-weekly service between Erbil and Dubai, and a weekly flight to Frankfurt.

Parwen Babaker, the minister of industry for the eastern sector, was hard-pressed to specify any foreign manufacturing investments there, finally citing a British tobacco-products plant, capitalized at a scant 2.5 million dollars, and a small Italian-owned garment factory. "The gross domestic product of Kurdistan? I can't give you a figure for that," conceded Abdullah Abdulrahim, the region's deputy minister of economy and finance.

As for political institutions, their "facts on the ground" were as chaotic—and prolific—as the building boom. Depending on who did the counting, in 2005 Kurdistan answered to two, three, or four masters. There was the nominal central government in Baghdad, elected in a nationwide vote, endorsed by the U.S.-led occupation authorities—and all but impotent beyond the Iraqi capital and a few outlying cities. In Suleimaniya there was the bureaucracy

formed by Jalal Talabani's Patriotic Union of Kurdistan (PUK), one of the two main Kurdish political coalitions. To the west, in Erbil, there was the parallel bureaucracy of veteran guerrilla leader Masoud Barzani's Kurdistan Democratic Party (KDP). And since June Erbil has also hosted the putative combined regional government of a united Iraqi Kurdistan, with Barzani as its president.

Evidence of just how divided the region is: It was impossible to make phone calls between the rival cities of Suleimaniya and Erbil, which are just 95 miles apart, and the shiny new post office in Suleimaniya processes letters only to and from addresses in its own province.

This bewildering situation has its roots not only in the Kurds' longstanding conflict with Arab Iraq, but also in fratricidal tensions among the Kurds themselves. As recently as the mid-1990s, the PUK and KDP fought a murderous internal war in which thousands were killed. It was fighting between Kurds, not with Saddam's army, that had sent the most recent wave of Kurdish refugees fleeing overseas, and pushed former Warriors like Majid Nadir firmly into the camp of the Builders.

One night when I joined him as he smoked a cigarette in the street outside his house, Majid vented his bitterness at the Warriors. "Look at the problems between the two parts of Kurdistan. Look at that shameful war they dragged us into. It's impossible not to ask, What have they done to move us forward?"

"Personally, I've already suffered too much, thanks to them. What I want now is for my children to be happy. I want them to have a future."

Nowhere did the future seem shakier, however, than in Kirkuk, a city with no Builders at all. A city that its U.S.-appointed Kurdish mayor, Abdulrahman Mustafa, described as "basically in ruins, even though more than a million people live here."

History has taught the Kurds the importance of territory, and Kirkuk, they say, belongs to them. The city has been a focal point of Kurdish culture for centuries and today is the cornerstone of Kurdish dreams. Kirkuk is not simply the Kurds' Jerusalem: It is also their El Dorado, a staggering treasure trove that could make their dreams a reality. The nine-billion-barrel oil field





Guests in traditional Kurdish clothes gather at wedding near Halabja, the site of a 1988 chemical attack ordered by Saddam that killed 5,000 Kurds. The wedding couple had escaped to Iran with their families but have returned. "It's peaceful here now," says Arazw Ahmad, the bride. "We hope it stays that way."

SOLEMN WITNESSES

IT'S NOT UNUSUAL for women to speak their minds in Kurdistan— or serve as military officers or engineers. “All that matters is getting the job done.”

already in operation is a 500-billion-dollar bank account for independence, and some experts believe that the northern reserves hold as much as 40 billion barrels. The problem is that the city lies outside the area now controlled by the Kurdistan Regional Government. It will require arms, the Warriors insisted, to secure it.

The Kurdish warlord of this shattered realm was General Rostam Hamid Rahim, known locally as Mam (Uncle). After the oil field incident and its death threats, most of our commutes to Kirkuk from the safety of the protected zone were in Rostam's SUV, with the general himself at the wheel, surrounded by machine-gun equipped pickup trucks full of peshmerga sharpshooters. Each trip was a graphic sortie into the Warrior ethos. But the most chilling insight came from a story that was meant to be faintly comic, related one evening by a friend of the Nadirs.

“Mam Rostam was critically wounded,” she began, “and in the mid-1990s the peshmerga sent him to Germany, where we were refugees then, for treatment.” He remained there for a year, past his convalescence, she went on, “and like all of us, he was required to fill out an employment form when he left the hospital.”

The first question read: Previous Job. Rostam immediately scribbled in the German word *feldherr*, “general.” The story had it that he paused only briefly before answering the second question: Special Skills.

“Killing my enemies,” he wrote.

A native Kirkuki, Rostam was a stocky, powerfully built man who veered, unpredictably, from the cold-blooded decisiveness that made him a legendary guerrilla leader to mawkish excesses of sentimentality fed by enormous quantities of alcohol. Over one endless dinner I watched Rostam put away a fifth of Scotch and half a dozen beers by himself. The faces in the room that long night were a study in the extremes of physical diversity. Tiger Woods could be a Kurd—and so could Robert Redford.

Kurdistan is one of the Earth's most strategic land bridges, serving as an invasion and emigration route between Asia and Europe for thousands of years. Over the centuries, the Kurds have mixed with all of their neighbors and invaders, producing a gene map that ranges from wiry-haired and dark to blond and blue-eyed. The bond that holds these people together is “a sentiment as much as anything else,” one Kurdish archaeologist told me, “derived from traditional life in the mountain valleys and adjacent plains where Kurds have always lived, and from the embrace of a shared culture and identity.”

Someone in Rostam's entourage almost always sang Kurdish songs during those boozy dinners—about life in the mountains, about love, death, and loss—that inevitably reduced the general to tears. But next morning, the Warrior always returned, prepared to use his Special Skills.

His hero and model, he told me, was Genghis Khan's grandson Hulegu. In 1258 Hulegu sacked Baghdad, ordering the slaughter of 800,000 Arabs. Not surprisingly, Rostam regarded the war-weariness of the Builders, especially the educated young, with disdain. “The kids today are soft as chocolate bars,” he said.

In Kirkuk no one indulged in chocolate-bar methods. In the seven decades before the gulf war, the Kurds mounted countless failed uprisings against Baghdad. Some insurrections were initially encouraged by supporters in the U.S., then abandoned by them and crushed by Iraqi forces. Control over oil-rich Kirkuk was an issue in every one of those insurrections.

Beginning in the 1980s, Saddam Hussein pushed aggressively for the Arabization of Kirkuk, expelling thousands of Kurds from the city. Since his fall, thousands of Kurds have returned, living in tents and ramshackle hovels ■ short distance from their former homes, now occupied by thousands of Arabs installed in Kirkuk after the Kurds' expulsion.

Kirkuk is the most ethnically divided city in Iraq, a tinderbox of claims and counterclaims



“I’M DETERMINED to keep all the workers employed,” says Parwen Babaker, in pink, minister of industry in Iraqi Kurdistan’s eastern sector, after listening to employees’ concerns about downsizing at a Suleimaniya cement factory. At the city’s university (below) female students prepare for positions of power. “Women in Kurdistan have gained many rights,” says Babaker, “not only to wear the clothes they like, but to get involved in political and social life.”





One of the millions of unmapped land mines in northern Iraq ripped into Hamina Khidhir Abdullah as she was picking wild herbs in the mountains. After treatment at this emergency hospital in Suleimaniya, she returned to her mud-brick home to wait for an artificial leg.

INNOCENT CASUALTY



THE WARRIORS' POLICY is simple: Every Arab who was moved to Kirkuk should be kicked out. It is an undisguised demand for reverse ethnic cleansing.

pitting Turkomans, Assyrian Christians, Shiite and Sunni Muslims against each other, and all of them against the Kurds. Lip service was given on all sides to resolving the ethnic tensions peacefully. But no one really believed it was possible.

The policy approach of the Warriors is simplicity itself: Every Arab who was moved to Kirkuk during Arabization should be kicked out. The two generations of non-Kirkuki Arabs born there since would also have to go. It is an undisguised demand for reverse ethnic cleansing.

"We call it justice," Rostam said—and most Kurds agreed with him.

As a reporter, I'd seen close-up the kind of justice the Kurds are asking for in Kirkuk—in Bosnia, Croatia, Kosovo. I'd seen the carnage wrought by ethnic nationalism in Northern Ireland and Basque Spain, the blind hatred in Israel and on the West Bank. After the Balkans, after Rwanda, the justice of ethnic nationalism was lost on me. But I'm not an Iraqi Kurd.

Another morning like any other in Kirkuk: We were en route to an interview when a loud thump shook the air, and an acrid column of smoke billowed into the sky. A young man had detonated 80 pounds of explosives and bolts strapped to his waist. The blast, outside a mosque roughly a quarter mile up the road, killed 23 people and wounded more than 80. Had we arrived a minute sooner, we would certainly have been among them.

There is nothing unusual about happenstance salvation south of the 36th parallel, or about happenstance death. A minute here, a minute there: the random distinction between obliteration and morning prayer.

This time, Rostam rammed his SUV in a 180-degree spin, and we tore a few blocks west to the headquarters of the Kurdish-led Emergency Services Unit (ESU), an elite rapid deployment force. A phalanx of armored vehicles was forming in the motor pool, ready to head for the bombing scene. Just after we sat down for a briefing in the

office of the ESU's commander, Khattab Omar Arif, six men quietly filed in behind us.

They were one of the American counter-insurgency squads that show up in the wake of terrorist attacks. "Maybe Delta Force, maybe CIA, maybe something else," our interpreter whispered in my ear. "Nobody is really sure who they are."

The men wore no uniforms and no identification tags, and their squad leader's sole words to us were "no questions and no photographs." His comrades sported an eclectic Hells Angels' mix of shaved heads and shoulder-length hair swept into ponytails. One of them wore a black T-shirt emblazoned with a skull and crossbones. Their arms cradled assault weapons with sniper scopes, and they had pistols in leg and shoulder holsters and tucked into the rear of their slacks.

Locals refer to them as Rambos. For an hour the Rambos sat in silence, eating fruit and sipping tea, listening intently as I interviewed Commander Arif. They were the only Americans we encountered in Kirkuk.

Behind the thinly veiled pretense of a search for national unity, Kirkuk was locked in an undeclared ethnic civil war. Some Rambos had reportedly collaborated with the ESU in the unexplained disappearances of hundreds of Kirkuk Arabs and Turkomans, many of whom turned up without formal charges in Kurdish prisons.


The chief of a police station on the city's northern end greeted me with the chevrons of a peshmerga major buttoned onto his shoulders. But halfway through our interview, to prepare for the arrival of a delegation visiting from Baghdad, he replaced them with the insignia of a captain in the Iraqi National Army. Most of his men were peshmerga veterans like himself, and he said he had flatly refused a command from the central government to begin replacing them with Arabs.

A similar order directed at the Oil Protection Force was also dismissed by its commander. All 3,000 of the men who patrolled the 384-square-mile Kirkuk oil field in 2005 were Kurds. But



KIRKUK IS HOME to Amina Namiq, confirmed by her official ID. She and tens of thousands of other Kurds were evicted from the city in the early 1980s, when Saddam Hussein tried to make Kirkuk ethnically Arab. With Saddam now in jail, exiles have flooded back but have ended up in squatters camps. As Arabs and Kurds fight for control of the city, bombings, shootouts, and kidnappings put everyone on edge. Lunch offers police a rare respite (below).



A photograph showing two men in silhouette in the foreground, looking towards the right. They are standing on a hill overlooking a vast oil installation in Kirkuk, Iraq. The installation features numerous large white storage tanks, pipes, and industrial structures under a clear blue sky. The ground is a mix of dirt and sparse vegetation.

Formed after the fall of Saddam Hussein, the Kurdish-dominated Oil Protection Force patrols a Kirkuk oil installation. Kirkuk sits on almost nine billion barrels of crude—one of the largest reserves in the world and a key reason the Kurds are demanding control of the city.

A FORTUNE IN OIL



according to a National Oil Company (NOC) source, there were only 160 Kurds among its 10,000 workers, the majority of whom owed their jobs to Saddam's Baathist Party.

The effect was near paralysis. The enormous field was littered with abandoned pipes, rusted pumps, and broken machinery. NOC officials declined to supply any production figures, but the level of activity was visibly low. No significant investments have been made in equipment or technology since before the gulf war, as international energy firms waited to see who would win the struggle for Kirkuk.

"What you're looking at is an oil museum," a staff engineer said. "Everything in it is obsolete." Then he grew somber. "I'd estimate that at least half of our employees have links to terrorists. The rest of us are afraid, every minute of every day."

According to Iraq's oil ministry, there were 642 terrorist attacks on oil fields in 2004, at a cost of ten billion dollars. In the first six months of 2005, terrorists struck at U.S. and Iraqi military targets outside the protected zone more than 12,000 times.

How could the Kurds imagine reunification with Arab Iraq, I asked myself. How could the world expect it of them?

The roads in Kurdistan say all you need to know about the Kurds' view of the future. On a new multilane highway west of Suleimaniya, where Parwen Nadir is employed as an engineer, laborers trucked in from the refugee camps of Kirkuk wield picks and shovels around the clock. They grunt in the fierce sun by day, and by night they toil under the glare of klieg lights, readying the terrain for bulldozers and asphalt rollers. Hundreds of miles of roads are being pushed through the mountains. All of them link cities in Kurdistan to each other or to its foreign borders. The roads south, toward Arab Iraq, are in a state of advanced disrepair. They will not be needed when Iraqi Kurdistan is free.

The aims of the Builders and Warriors converge on those roads; they are united, despite their other differences, in their position on rejoining Iraq. "Deep down, nobody in Kurdistan supports it, from babies in their cradles to the oldest men in our villages," Mam Rostam insisted.

"The Arabs have punished us too much, for too long," agreed Omar Rahan, 64, a shepherd

in a hamlet of 80 families in the northern mountains. "They attacked this village in 1977, then again in 1986 and 1991. They destroyed every house, every tree. Every time we came back and rebuilt. You won't find anyone here who wants to be part of Iraq again."

In an informal referendum held in Kurdish-dominated regions during the January 2005 Iraqi elections, 98.7 percent of Kurds voted for full independence rather than reconciliation with Arab Iraq. "Among young people, the figure is probably 100 percent," asserted Rebwar Hasan, 25, a reporter at *Hawlati (The Citizen)*, Kurdistan's largest circulation newspaper.

On sheer practical terms, said Mohsen Omar, a celebrated Kurdish writer, "it's very difficult for Kurds to conceive of life in a reunified Iraq, especially the younger generation." After a decade and a half of Kurdish education in the protected zone, he noted, "almost no one under 30 even speaks Arabic."

Nowhere in the KDP sector of Kurdistan was an Iraqi flag flying or any semblance of Iraq's supposed central authority evident when Ed and I wandered its length and breadth. "I was raised thinking of this as our beautiful mountainous north, but now I see that the Kurds have made it their north, and that we're not welcome," said Inaam Hassan al-Yasiry, 26, an Arab women's rights advocate from central Iraq who was attending a conference in Erbil. "Personally, I still consider the Kurds Iraqis, but they make it clear they don't see themselves that way."

The picture was only slightly less dramatic in the region's eastern sector, thanks to the elevation of PUK leader Jalal Talabani to Iraq's interim presidency last April. In public Talabani has argued for a federal state, with significant local autonomy for Kurds under a national government in Baghdad. But few people in his Suleimaniya fiefdom doubted that his private goal, his fundamental purpose, was to oversee Kurdistan's inexorable drive to full independence.

For his part, KDP chief Masoud Barzani was blunt in his assessment of Kurdistan's destiny: "Self-determination is the natural right of our people," he said after the 2005 referendum. "When the right time comes, it will become a reality."

It would be one thing if the Kurds of Iraq lived in a vacuum, where the prospects for full self-determination rested only on their own

tenacity. But they must also contend with their neighbors—Iran, Turkey, Syria—each of which has its own sizable Kurdish community, each of which is deeply hostile to the establishment of an independent Kurdistan in northern Iraq, fearing it would threaten control over their own restless Kurdish people.

“We need our neighbors. We need their trade, their economic cooperation, and coordination on security matters,” said Shafiq Qazzaz, a close adviser to Masoud Barzani. “But they all see any aspiration of Kurdish nationalism as anathema.”

One result has been a transparently double-tracked political strategy. “Yes, we make a commitment to Iraq, to the process of establishing a federal state,” Qazzaz continued. “But at the same time we must also seek another way, in case

a truly federal Iraq proves unfeasible.”

None of the Kurds’ present allies, including the U.S., is likely to back Kurdish independence against the combined will of Tehran, Ankara, and Damascus.

When Barzani’s “right time” arrives, the Kurds will face it alone. Neither the Builders nor the Warriors harbor any illusions about that.

“The Americans liberated us from Saddam, but they did it for their own interests,” Majid Nadir told me. “History says they’ll abandon us, as the outside world always does, when it’s in their interest.” □

IRAQ’S BEST HOPE? Experience the Sights & Sounds of Iraq’s Kurds—and find out why photographer Ed Kashi says they “symbolize the hope of all the people of Iraq.” Then view more images ■ an exclusive online gallery at ngm.com/0601.



THE SIMPLE PLEASURE of a family picnic near Shaqlawa shows that life is returning to normal for many Kurds. A generation ago Kurdish guerrillas fought the Iraqi Army in these same mountains. Now the region draws weekend visitors, including Arabs, from as far away as Baghdad. Though the Kurds’ political fate remains unsettled, one thing is certain: The longer violence continues in the south, the more likely the Kurds are to push for independence.

In the Iraqi desert, crime-scene investigators are finding new forensic evidence of Saddam Hussein's murderous regime. Their discoveries echo the mass killings of the past century—the bloodiest in history—and offer hope that future mass murderers can be brought to trial.

By Lewis M. Simons

MORE THAN 50 MILLION people were systematically murdered in the past 100 years—the century of mass murder: From 1915 to 1923 Ottoman Turks slaughtered up to 1.5 million Armenians. In mid-century the Nazis liquidated six million Jews, three million Soviet POWs, two million Poles, and 400,000 other “undesirables.” Mao Zedong killed 30 million Chinese, and the Soviet government murdered 20 million of its own people. In the 1970s the communist Khmer Rouge killed 1.7 million of their fellow Cambodians. In the 1980s and early '90s Saddam Hussein's Baath Party killed 100,000 Kurds. Rwanda's Hutu-led military wiped out 800,000 members of the Tutsi minority in the 1990s. Now there is genocide in Sudan's Darfur region.

In sheer numbers, these and other killings make the 20th century the bloodiest period in human history. In 1944 Raphael Lemkin, a Polish-Jewish scholar who lost almost all of his family in the Nazi Holocaust, coined the word “genocide,” from *genos*, Greek for tribe or family, and *-cide*, from the Latin for kill. Four years later, after the Nuremberg trials, the crime of genocide was recognized by the United Nations as the deliberate destruction of a racial, religious, or ethnic group. Today most societies add mass political killings to that definition.

Paul Rubenstein lost much of his family in the Holocaust. “Afterwards people said, ‘Never again,’” he told me quietly as we drove through a U.S. military base near Baghdad. “Now I'm helping to develop the science to continue studying this kind of thing.” He paused. “It's hard to

Genocide

and the Science of Proof

imagine that I'm in the vanguard of the science of mass murders and mass burials. This wasn't supposed to happen today."

Rubenstein is an anthropologist and a civilian employee of the U.S. Army Corps of Engineers. He's also the deputy director of the forensics lab at Camp Slayer near Baghdad. For two years, even as Iraq's insurgency has grown deadlier, Rubenstein and a small team of scientists, most from the U.S. but also a few from other coalition countries, have been exhuming remains from mass graves. Using forensic techniques—linking bones, clothing remnants, identity cards, jewelry, photographs with names on captured government death warrants—they're coaxing secrets out of the death pits to determine who the victims were, where they came from, who killed them, and how, when, and why. Since 2004, U.S. officials say, hundreds of skeletons have been exhumed and turned over to the forensics team.

Although that number is tiny compared with the total number of Iraqis murdered, the effort is an impressive marshaling of the forces of science, all aimed at building airtight legal cases.

The forensic work at Camp Slayer is sponsored and choreographed by the U.S. Department of Justice, whose vested interest in proving Saddam Hussein a mass murderer has evolved as the Bush Administration's stated reasons for invading Iraq (weapons of mass destruction, links to 9/11) have proved false. Still, even as the death count mounts by the day—an estimated 26,000 Iraqis and 2,000 Americans and

allies killed by late 2005—the investigation could bring value that surpasses the warfare and politics of the moment. If the forensics specialists demonstrate that Saddam Hussein and other mass murderers can be successfully brought to justice, they may help build a potent preventive against genocides of the future. This, at least, is the idealistic hope.

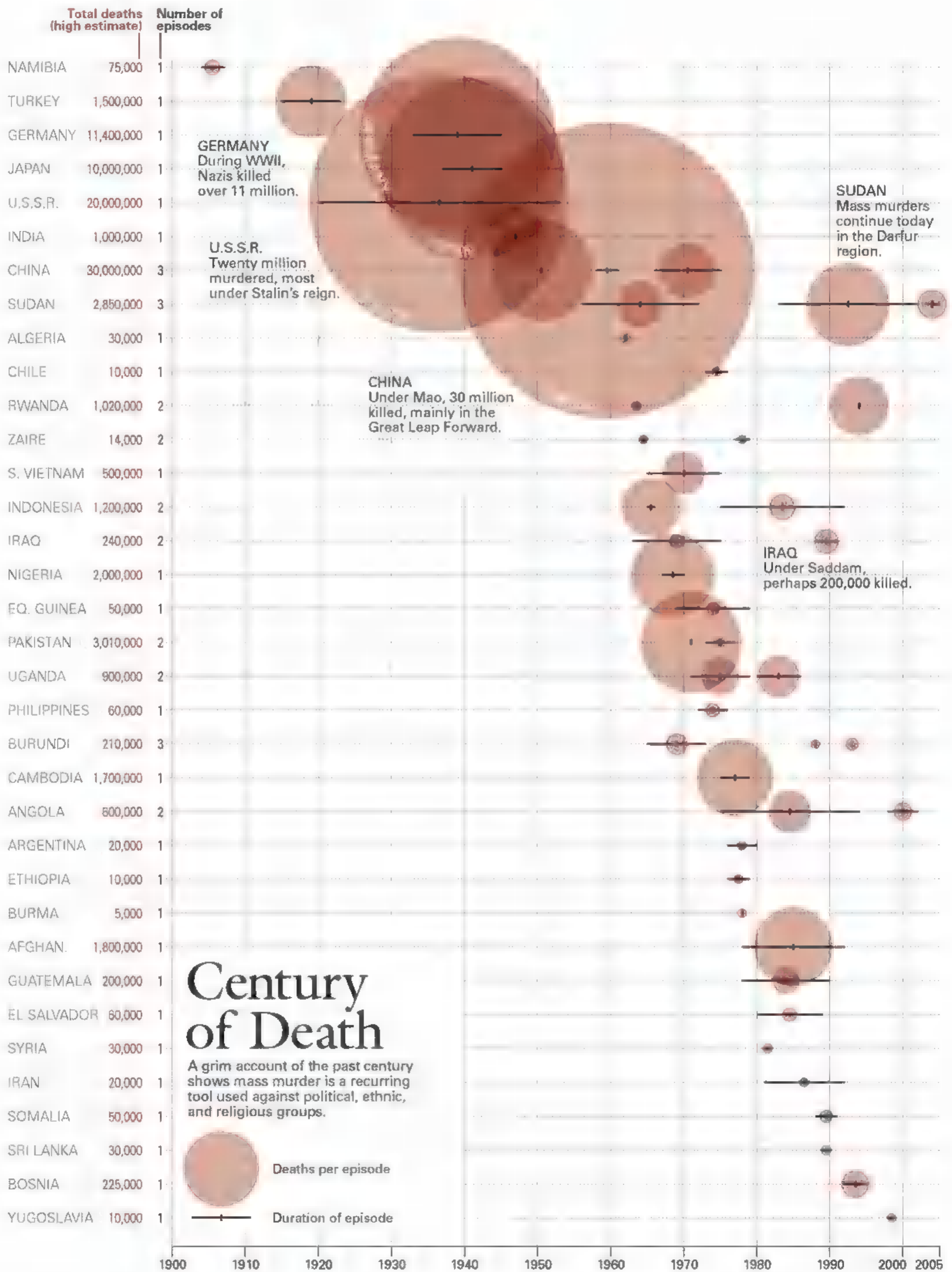
The forensics facility occupies part of the grounds of a former palace compound of Saddam Hussein's, a onetime pleasure court with swimming pools and boating ponds that now bristles with antennas and satellite dishes servicing CIA, FBI, and U.S. military intelligence operations. Rubenstein walked me through a quaintly incongruous white picket fence to a cluster of well-lit, air-conditioned tents, where I met specialists examining, x-raying, and photographing skeletons and studying clothing and artifacts such as jewelry, wallets, and government identity cards. Patterns of neat bullet holes peppered skulls and garments, many of them the baggy trousers peculiar to Kurdish men. Staring at cardboard boxes filled with skulls in plastic bags and skeletons precisely arrayed on steel gurneys, inhaling the oddly metallic death smells, I flashed on America's current fascination with

AUSCHWITZ - BIRKENAU 1944

The simple possessions of the doomed lie preserved behind glass at the largest of the Nazi death camps. Stripped of their identities, Jews and others were murdered here by the most organized killing machine the world has known.



JANE EVELYN ATWOOD, CONTACT PRESS IMAGES



SOURCE: BARBARA HARFF, STRASSLER FAMILY CENTER FOR HOLOCAUST AND GENOCIDE STUDIES, CLARK UNIVERSITY
NG MAPS

TV forensics programs like *CSI* and *Crossing Jordan*. The real thing is not entertaining.

Rubenstein was for the most part all business. I reasoned that this was his way of protecting himself, not just from an inquisitive journalist but also from the nightmare he lived each day. Once, though, he let down his guard. “As you work with the victims, especially the children—their clothing, the baby bottles, the little shoes, just like the ones we bought for our daughters years ago, the little hands, so expressive in death—you have to try not to get into the heads of the monsters who did this, or it becomes overwhelming. You look at a perfectly knitted baby bonnet with two bullet holes in it, and you think, These could be your own kids.”

The killers sometimes treated men, women, and children differently. “The men show signs of torture, of being tied and handcuffed,” Rubenstein said. “The women often had children with them and received, perhaps, the blessing of being shot once at close range. All of this is based on clear evidence, not speculation.”

An early step in the forensic analysis is to remove clothing and personal possessions from skeletons before the specialists start examining the remains. This, explained Joan Bytheway, a forensic anthropologist from the University of Pittsburgh, is to ensure that experts don’t form biases about the victims. Bytheway pointed out an entry hole at the top of a skull that she cradled, an exit hole near the left eye socket, and a radiating crack in the left cheek. Only after she and the other anthropologists incorporate

findings like this into biographical profiles—“female, mid-30s, five foot four to five foot six”—do they reunite bones and possessions.

A few feet away from where Bytheway was working, Tim Anson, an Australian anthropologist from the University of Adelaide, showed me a partial skeleton on a gurney. It had been recovered from a grave near Al Hadr, about 55 miles southwest of Mosul. The most obvious thing about it was that only the back of the skull remained. “The entire face was blown away,” said Anson. He also noted leathery, mummified tissue in the forearms and explained that this was because the person had been buried in the middle layer of a grave 12 to 14 feet deep. Even after as long as 20 years in the earth, bodies farther underground often contain fat and other soft tissue, while those closer to the top are reduced to bare bones.

In an adjacent tent radiographer Jim Kister demonstrated his work with a Faxitron, used to x-ray bones to identify the source of trauma. He clamped a large transparency of a man’s rib cage to a light box and pointed to a bullet. “This guy took 11 bullets,” he said. “He was shot to hell.” Kister said he anticipated that defendants in the Baghdad trials would try to claim that

R W A N D A 1 9 9 4

Hutu mobs armed with machetes and other weapons killed roughly 8,000 Tutsis a day during a three-month campaign of terror. Powerful nations stood by as the slaughter surged on despite pleas from Rwandan and UN observers.



JIM NACHTWEY, VII

shattered bones were postmortem and therefore inadmissible evidence. "These pictures tell a different story."

So far the forensics team has only identified about 15 percent of the skeletons examined. The results will be collected in a massive report by the Army Corps of Engineers. It won't be made public for many years, not until after the trials—decades after Iraq's mass killings began in 1987. The eight-year war with neighboring Iran was ratcheting down, and Saddam Hussein had ordered his bedraggled army to punish the minority Kurdish community, many of whom had supported Iran. Saddam Hussein used this involvement as an excuse to attempt to eradicate the Kurdish population, which had long been a thorn in his side. (See "The Kurds in Control," page 2.) By the time the campaign ended more than a year later, an estimated 100,000 Kurds were dead (though some Iraqi interest groups put the number as high as 182,000), including thousands poisoned by chemical weapons. Most were buried in secret mass graves.

Although reports of the killings became public almost immediately, President Ronald Reagan's administration and the State Department chose to ignore them. Because the administration had actively backed Iraq against Iran, the U.S. government was determined not to offend Saddam Hussein. He may have been a mass murderer, but at least he was, to paraphrase President Lyndon Johnson's reference to a South Vietnamese ally, *our* murderer.

Among the bones were scattered the simple things of daily life: white plastic yogurt tubs, earrings, identification cards, plastic watches, baby shoes.

Rubenstein acknowledged that with his mission narrowly focused on supplying evidence for the trials, recovering thousands of corpses from mass graves and returning them to families was not the administration's first priority (though some of the team may remain behind to help). "That will have to be left to the Iraqis," he said. "We're part of the litigation process. We're here to provide the same level of evidence that would be used in courts in the United States."

ON THE SOUTH COAST of England, a world away from Iraq but joined to it by death, I visited Margaret Cox on the leafy, modern campus of Bournemouth University. Cox, an anthropologist and archaeologist, operates the International Forensics Centre of Excellence for the Investigation of Genocide (INFORCE). In 2004 Cox and her colleagues trained 33 Iraqis in the science of exhuming mass graves and identifying remains. (Under Saddam Hussein's government, Iraq had only a handful of forensic scientists to serve a population of 26 million.) After a five-month course that included exhuming a mock mass grave seeded with plastic skeletons, the group returned to Iraq where they began working on real graves and passing on their new knowledge to other Iraqis. During my visit, 12 of the most promising trainees were back in Bournemouth, polishing their skills.

Cox holds out hope that the investigative science she's teaching here, and that forensic scientists are developing in the field, carries promise for the new century. "If collected properly,

forensic evidence speaks for itself," she said. "And the realization that forensics can expose the perpetrators may be sufficient to stop a genocide before it happens." That remains to be seen, but if it ever happens, it will be a powerful example of science functioning in the interest of humanity.

A few miles across town from the campus is a nondescript strip of brown unmarked warehouses and storage spaces. There, in a brightly lit, white-walled room set up like a small morgue, Cox introduced me to one of the Iraqis who'd volunteered to give up their varied careers in Baghdad and come to Britain to learn this grisly science. The individual I spoke with, whom I'll call X, was extremely enthusiastic and hopeful about the central role group members would play in helping millions of Iraqis finally determine the fate of family members and achieve at least a small measure of psychological peace.

Initially, X gladly agreed to be identified in this story. But shortly before it went to press he got word to me of death threats against him and his family and that because of these threats he was delaying his return home. Based on what I'd learned from investigators while I was in Iraq, the threats most likely were made by Sunni supporters of Saddam Hussein, who are striving to diminish evidence against the former dictator.

While I was visiting the little morgue, the Iraqis were working alongside British instructors, sifting soil for bone fragments and studying x-rays for gunshot evidence. X told me what he believed lay ahead when he returned home

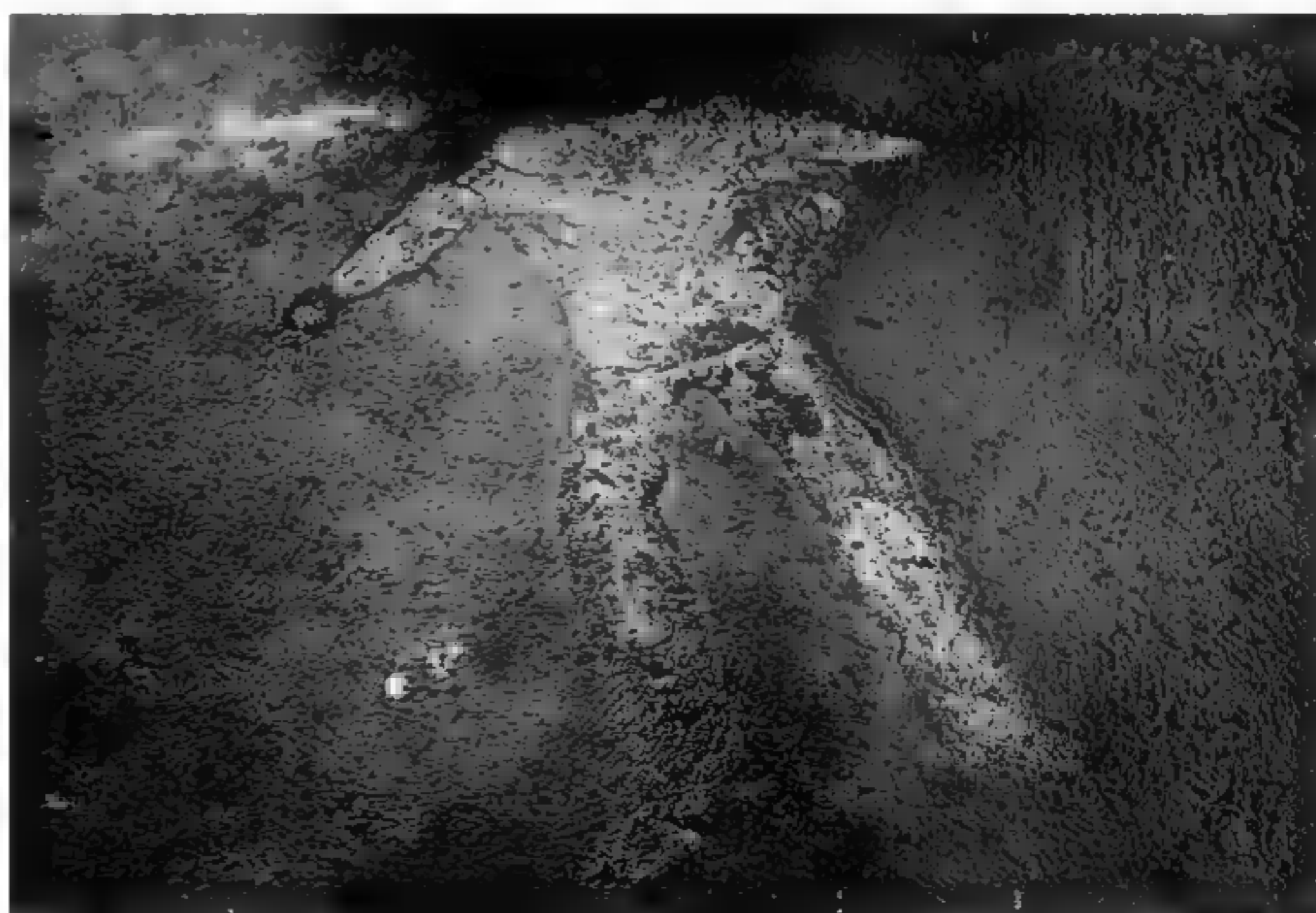
and how he planned to shift the focus of the task the Americans were carrying out. "Civil society is a new concept in Iraq," he said. "For us, the suffering of the dead is not over. The dead have rights, yes; they must have justice, yes; but the American approach, gathering evidence for the trial, is just the beginning. What we're doing is for the living."

No one can seriously question X's will and the nobility of his goals. But with the Bush Administration likely intending to pull out U.S. experts after the trials in Baghdad, coupled with the threats against X's life, the odds of X and his small number of Iraqi colleagues finding 100,000 or more murder victims and providing comfort to their families in the midst of seemingly endless warfare must be considered poor at best.

The Americans, with all their funds, expertise, equipment, and security, have set themselves a very limited goal. In Iraq, I'd flown in a U.S. Army Blackhawk helicopter to a gravesite in the Muthanna desert, near the border of Saudi Arabia, about 200 miles south of Baghdad. Because of their extreme sensitivity about protecting information related to Saddam's trial, the U.S. officials accompanying me would be no more specific about the location. As the

KOSOVO 1999

Seared into memory, the outline of a corpse marks a floor where mercenaries, acting on orders from Serb commanders, killed and burned a Muslim civilian. After the war, residents covered this ghost with a rug.



GARY KNIGHT, VII

Blackhawk made a tight circle, I looked out over a pale brown ocean of sand disturbed only by a misshapen doughnut of military tents, vehicles, and trailers. Called Camp Yankee, it was protected by concentric rings of private security contractors, courteous young men in mirrored glasses and military-style haircuts, carrying automatic weapons.

Off to one side a dark canopy shaded a fresh cut in the talcum-soft sand. The previous day American excavators had uncovered a tangle of skeletons about a shin's length beneath the surface. I could discern about 35 individuals, knee joints bent the wrong way, arms flung crazily over and under neighboring skeletons. Other layers were hidden beneath them.

The dry climate made for extraordinary preservation—complete skeletons, most dressed in the brilliant blues, reds, yellows, and oranges Kurdish women love. Some of the skulls were still draped with long hair. One contained a full set of pink and white dentures clamped in a mad grin. Another, near the center of the jumble, was hung with a waist-length beadwork necklace, eye sockets staring back at me, jaws stretched past the breaking point. Among the bones were scattered some of the simple things of daily life: white plastic yogurt tubs used to carry purchases home from the market, string bags of children's garments, earrings, government identity cards, plastic watches, baby shoes and bonnets.

Michael "Sonny" Trimble of the Army Corps of Engineers is in charge of the forensics team.

Back home, he is curator of the famed Kennewick Man, the 9,200-year-old skeleton found in 1996 on the bank of the Columbia River, near Kennewick, Washington. Trimble is well-known in his field, having overseen the exhumation of bodies in Southeast Asia and Bosnia.

"These people were killed here 15 to 17 years ago," he said. "The graves were dug with a single pass of a front loader blade—each one around 10 or 11 feet wide and 35 feet long—the same way their army dug tank berms. There are 10 to 13 graves at this site. About 1,500 bodies—Kurds, judging by their dress. They were sprayed with AK-47s. We found the shell casings along the edges of the pits. The killing process was methodical."

When Trimble and the other American experts leave the country, Iraqis will inherit a massive problem: How to bring about national reconciliation and settle decades of ethnic hatred. Kanan Makiya, an Iraqi author and professor of Middle Eastern studies at Brandeis University, is taking the first step. He heads a foundation that has amassed millions of government documents related to mass murders. Many were recovered from secret police headquarters in the days immediately after the fall of Saddam. Some evidence was inadvertently destroyed when Iraqis used backhoes to dig into the graves in their rush to find the remains of missing loved ones.

"Evidence for the trials is just the smallest part of what must be done," said Makiya. "The main goal is to put on trial not just the 10 or 12 top individuals but an entire system of government. You must keep in mind that almost all Iraqis were

"All of us—Kurds, Shia, Sunni—must acknowledge our own involvement. Otherwise we won't have healing."

caught up in the system, spying and reporting on each other. All of us—Kurds, Shia, Sunni—must come to terms with what I call the factional narratives that have replaced individual responsibility and acknowledge our own involvement. Otherwise we won't have healing.”

With Iraq's future very much unknown as insurgency whipsaws the country, no one can seriously address these deeper issues of peace and reconciliation. So, whether Iraqis will face them, as South Africans did in the 1990s, remains an open question.

ON MY HELICOPTER FLIGHT from Muthanna back to Baghdad, we carried 42 plastic footlockers, each containing a set of remains removed from the grave. We were delivering them to the team at Camp Slayer. I wrestled with a question: What is the human flaw that allows genocide to erupt again and again? More genocide has taken place within our lifetimes than at any other time. And much of it has happened while we in the so-called civilized world looked on or refused to look. Such was the case with Iraq.

To Nobel Peace Prize laureate Elie Wiesel, those who are indifferent are as guilty as the murderers. “The tragedy I know best, because I was personally involved in it, the Holocaust, made no distinction between the murderers and the bystanders,” he told me. “How can you be a bystander? We Jews suffered not just from what was inflicted on us by the perpetrators but also by the indifference of our friends. If those of us in the camps had known at the time that our

CRIMINAL INTENT Will humans ever overcome the ethnic hatreds and other factors that contribute to genocide? Cast a vote in an online poll and voice an opinion on our forum board at ngm.com/0601.

friends were not ignorant, but indifferent, we'd have gone beyond despair.”

Yet Wiesel, who is probably the world's best known authority on the subject of man's inhumanity to man, says there is some reason to believe that the work being done with Iraq's mass graves victims could help ensure that the 21st century is less violent than the one before it. “The moment you give a face and a name, not just to the victim but to the killer, people respond with greater comprehension,” he said. “It somehow puts limits on the phenomenon, which otherwise is incomprehensible because of the numbers and the magnitude.”

Wiesel's ability to discuss life at its darkest with the apparent ease that most of us bring to everyday conversation can be daunting. But he was perhaps the most optimistic—at least the most hopeful—person I spoke to.

“Only human beings can move me to despair,” he said. “But only human beings can remove me from despair.” □

IRAQ 1991

Faces of the missing crowd a desk in Iraq, where thousands vanished during Saddam Hussein's rule. Nearly 20 years after the bulk of his murders, the toll remains unknown. Says one U.S. official, “Any number you hear is a guess.”



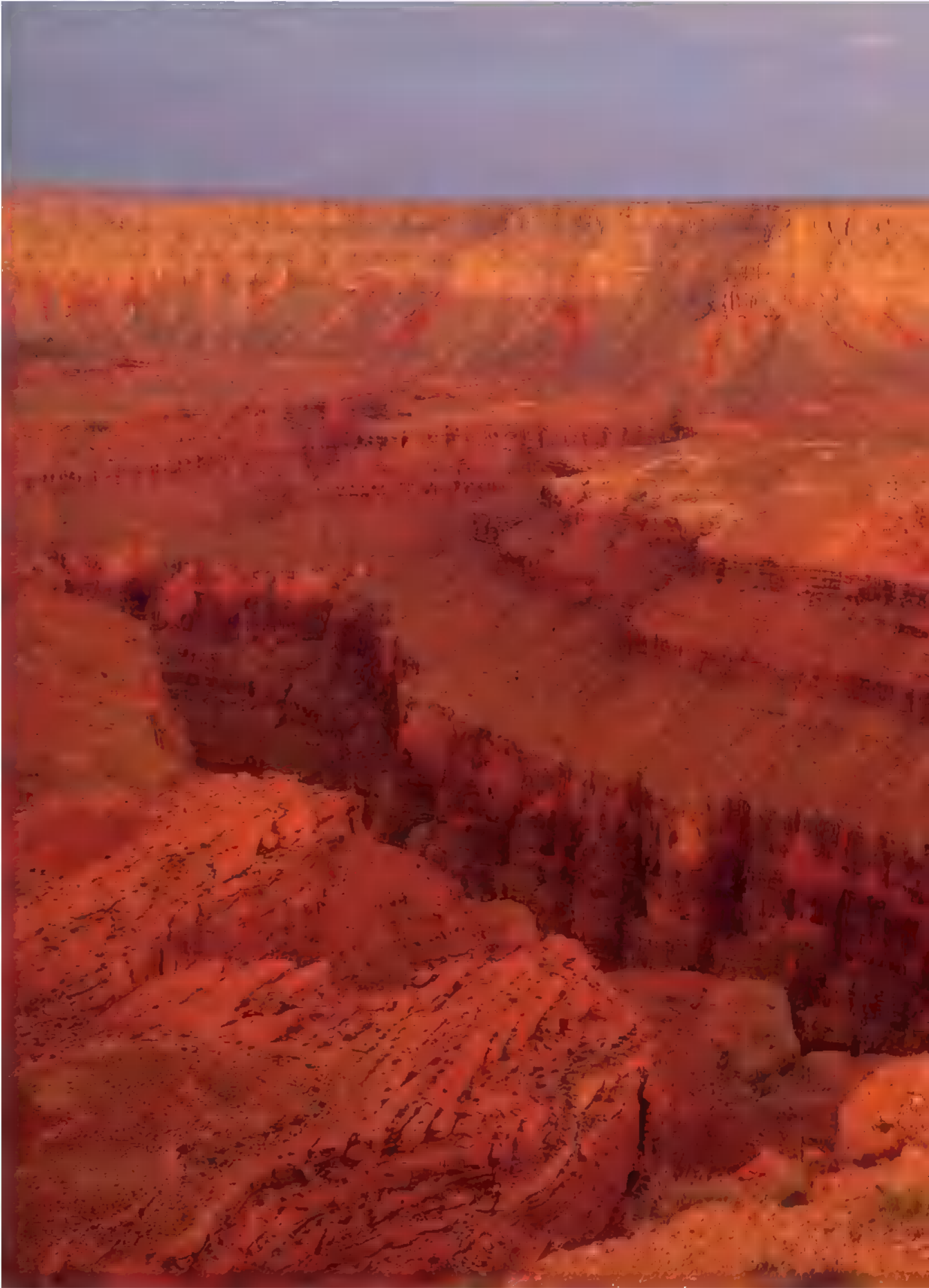
LEWIS M. SIMONS



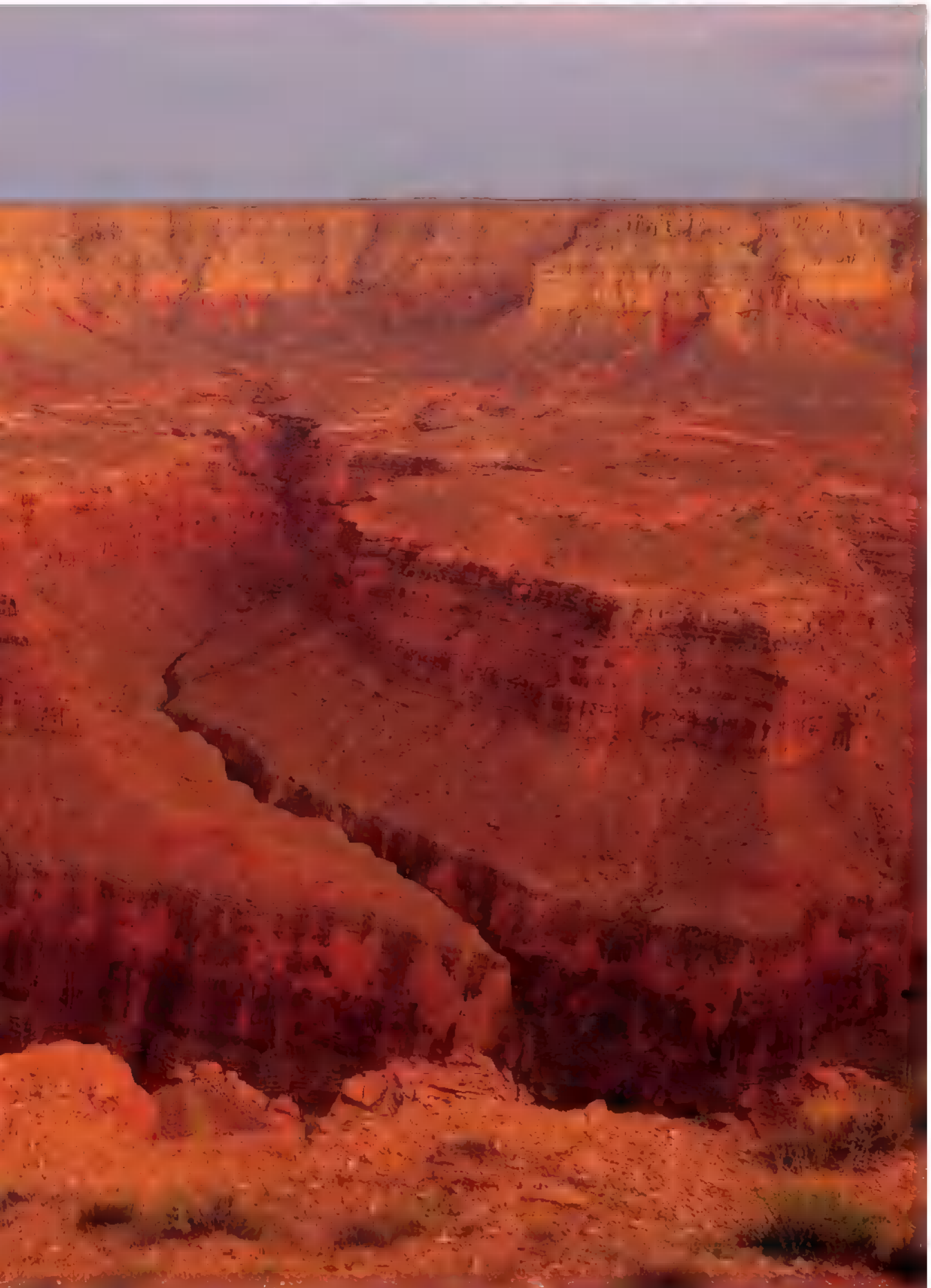
The Unexpected Canyon

Winter mists shape the view above Bright Angel Trail in Grand Canyon National Park.



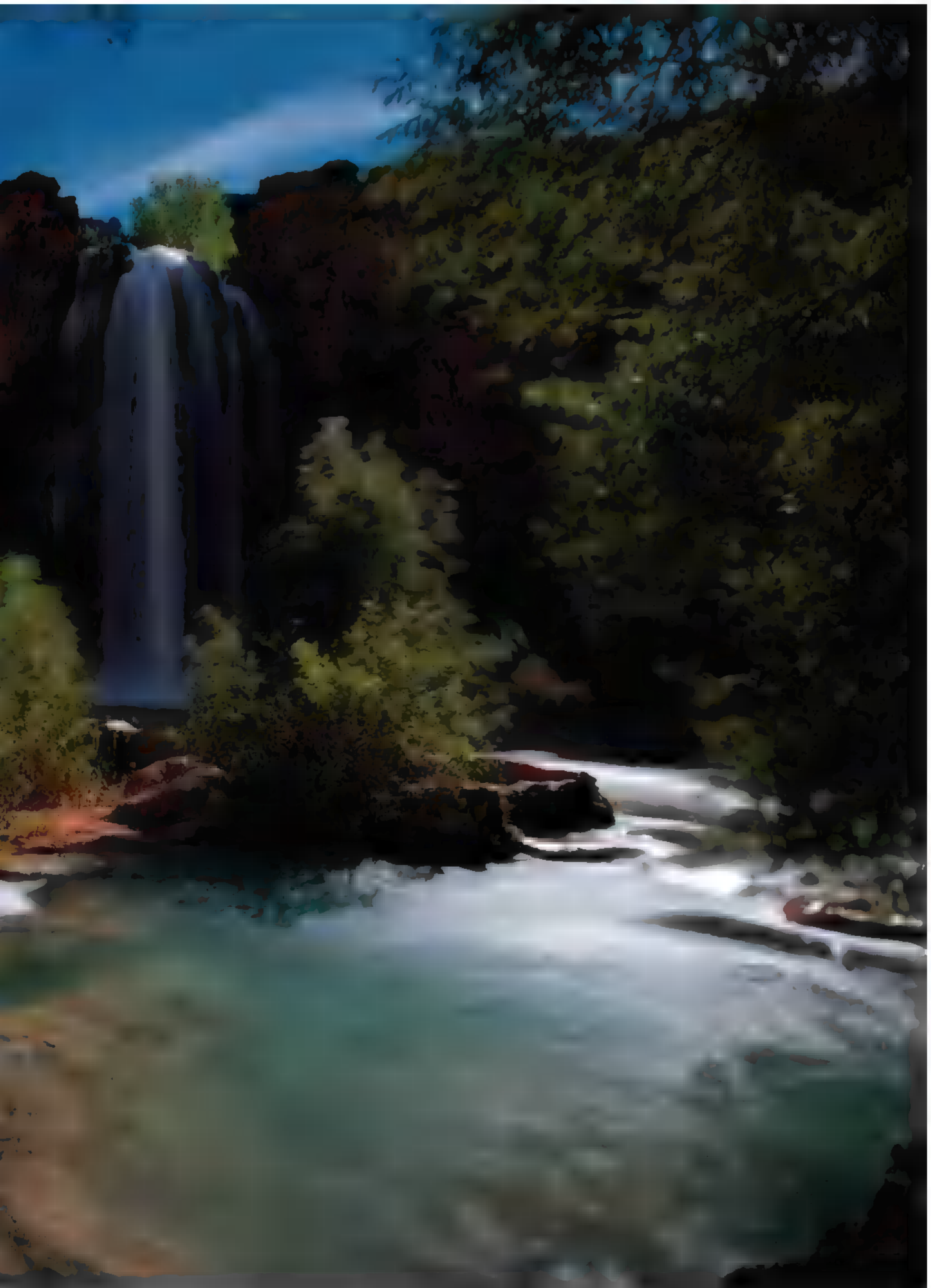


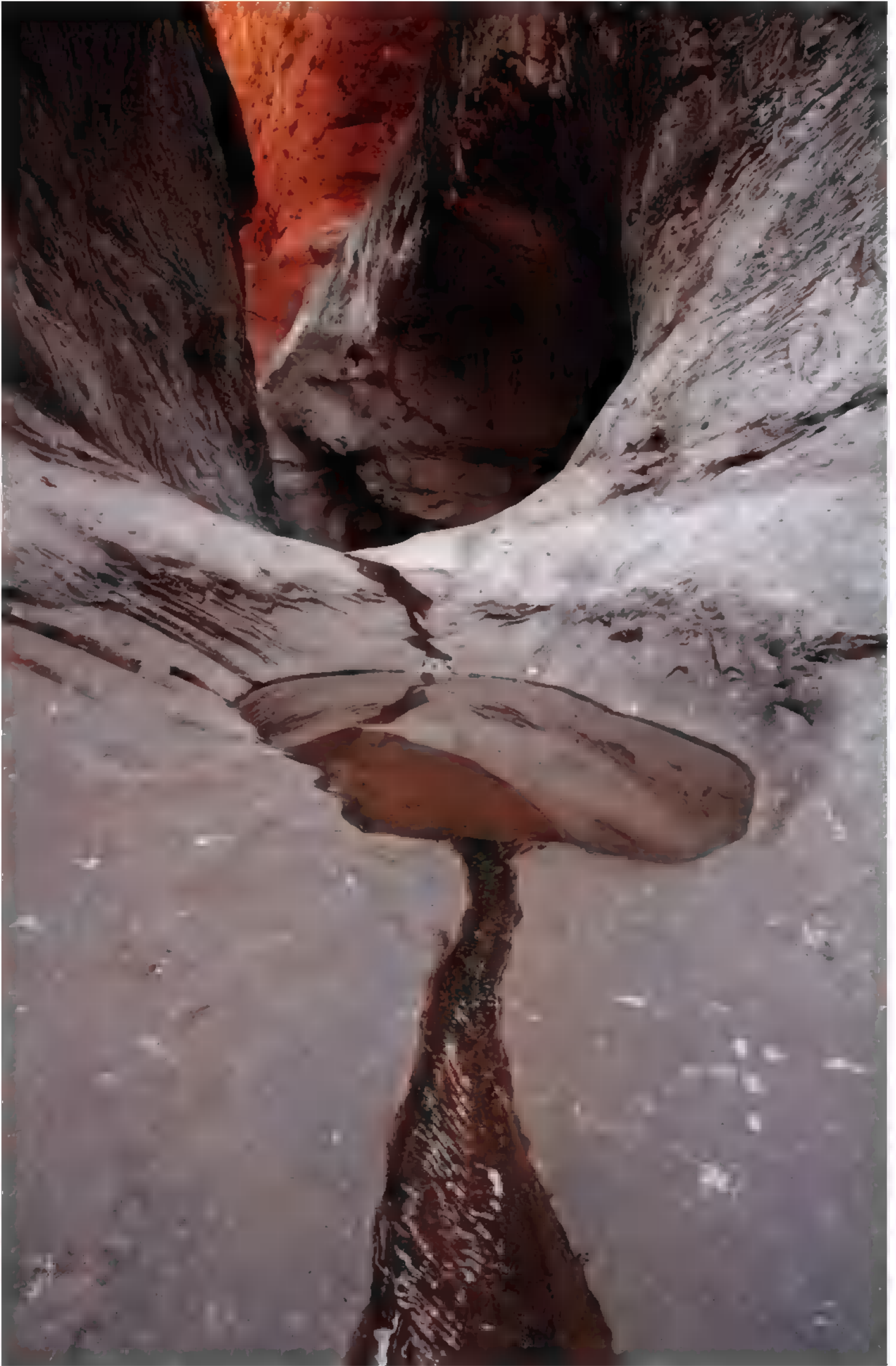
Clouds cast twilight colors onto canyon walls below SB Point.





Lit only by the moon, Havasu Falls thunders through the night.





A winter trickle spills through Silver Grotto.

BY VIRGINIA MORELL

PHOTOGRAPHS BY MICHAEL NICHOLS

NATIONAL GEOGRAPHIC PHOTOGRAPHER

It snowed furiously the night before I stepped over the South Rim of the Grand Canyon. It was mid-May, so the snow was wet and slushy, not dry enough to stick. But the moisture stained the soft soil at the trailhead a dove gray and spiced the air with the scent of ponderosa pine. The trail I was following, the New Hance, didn't dawdle but marched directly to the canyon's edge, took a sharp turn,

then plunged straight downhill, a no-nonsense approach to reaching its destination: the bottom of the canyon and the banks of the Colorado River nearly a vertical mile below.

Someone in a hurry had made this trail, I thought, as I braced each jarring step with my trekking poles; someone eager to get past the red-orange terraces rising in tiers above the river, to get down to the sandy beaches at the water's edge. Someone eager to reach home.

Home. It may seem implausible to the more than four million of us who come each year to marvel at the Grand Canyon, but this stupendous and seemingly uninhabitable geology, exalted since 1919 as a national park, was indeed once a home. For at least 10,000 years people lived, loved, traded, even farmed in the canyon's depths. They marked it with names, wove its temple-like pinnacles and bluffs into their lore, and breathed their spirits into every spring, every marbled cliff and boulder. And then, a mere century ago, newcomers to the canyon, overcome by its beauty, decided that no human habitation was ever again to mar the canyon park (aside from the buildings the new people built). Landforms that carried a name, a spirit of the past, were named anew.

"That New Hance Trail—virtually all the trails in the Grand Canyon—were made by our ancestors, the Hisatsinom," a Hopi named Leigh

Kuwanwisiwma told me as we sat at the South Rim before my descent. "Archaeologists call our ancestors the Anasazi, but that's a Navajo term that means 'old enemy.'"

Kuwanwisiwma lives hours to the east on Arizona's Third Mesa, where he's a farmer and director of the Hopi Cultural Preservation Office. But the Grand Canyon feels like home too.

"All this canyon land is covered with our footprints. It's where we had our genesis; where some of our clans farmed and lived until we were called to the mesas. It is where we make our sacred salt trek. It is where our spirits go when we die. It is where we learned the Hopi way of life, and the lessons that guide us. And the key lesson is the lesson of humility."

With that word Kuwanwisiwma had set me on the right path, and I leaned into the dust and the angle of the trail. All traces of the snowstorm had vanished. Powdery sandstone curled over my boots, and pebbles rolled like ball bearings underfoot. "We're in the desert now," said my guide, David Hogan, who's been clambering up and down the canyon for nine years. "There's no real water between here and the river, and that's eight miles away. People can die—they do die—from thirst down here."

The climate was only slightly wetter 1,300 years ago when the Hisatsinom (the Anasazi) moved into the canyon's depths to grow cotton,

corn, beans, and squash along the terraces and sandy beaches of the Colorado. Farming in the Grand Canyon seems as unlikely as farming on Mars, but the Anasazi were spectacularly successful at it. From about A.D. 700 to 1200—a span of 500 years, more than twice as long as the United States has existed—they knew this place “like the back of their hands,” said Hogan. “They knew every side canyon, every water hole, every place to hide, and every route in and out.”

They filled the canyon with what Kuwanwisiwma calls their “insignia”—ruins, bits of pottery, these trails, things they made and left behind. Hogan showed me one: a human stick figure and three stair steps carefully pecked into a pink boulder. The pictograph’s meaning was so clear that anyone could read it: “This way to the top.”

Probably they also had trail runners who carried messages from one community to another, as did the Southern Paiute who were living here in 1869 when John Wesley Powell boated down the Colorado. And maybe, like the Southern Paiute, they had a repertoire of songs to help them remember their web of canyon trails.

Of course there were others in the Grand Canyon for thousands of years before the Anasazi:

Paleo-Indians who hunted megafauna like the giant ground sloth, and later peoples who painted colorful figures on the canyon’s rock canvases. And after the Anasazi slowly migrated out of the canyon on the heels of a long drought, there were others still: Hopi, Zuni, Southern Paiute, Hualapai, Havasupai, and Navajo. “Never was there a time—until the coming of the park—when some of our brothers and sisters weren’t living in the canyon,” Kuwanwisiwma said.

THERE’S NO WAY TO KNOW what the earliest canyon dwellers thought when they first saw the Grand Canyon or looked up from its depths, where Hogan and I now finally stood, two days after starting out. Unlike those who had forged our trail, we had felt no urgency to reach home. We had lingered, picking our way up and down dusty side canyons, over limestone rocks studded with fossils, and across iron red mudflats that broke apart in flaky chunks. But as soon as we’d heard the river, our steps quickened. The temperature was approaching 100°F; the little streamlet we’d been following shrank to a trickle and then dwindled into separate pools, where tadpoles swam uncertainly in circles. And



there ahead of us, drawing us on, rushed the Colorado—a heaving tongue of jade green that lashed at the hard shale on the far shore and lapped more gently against our sandy beach.

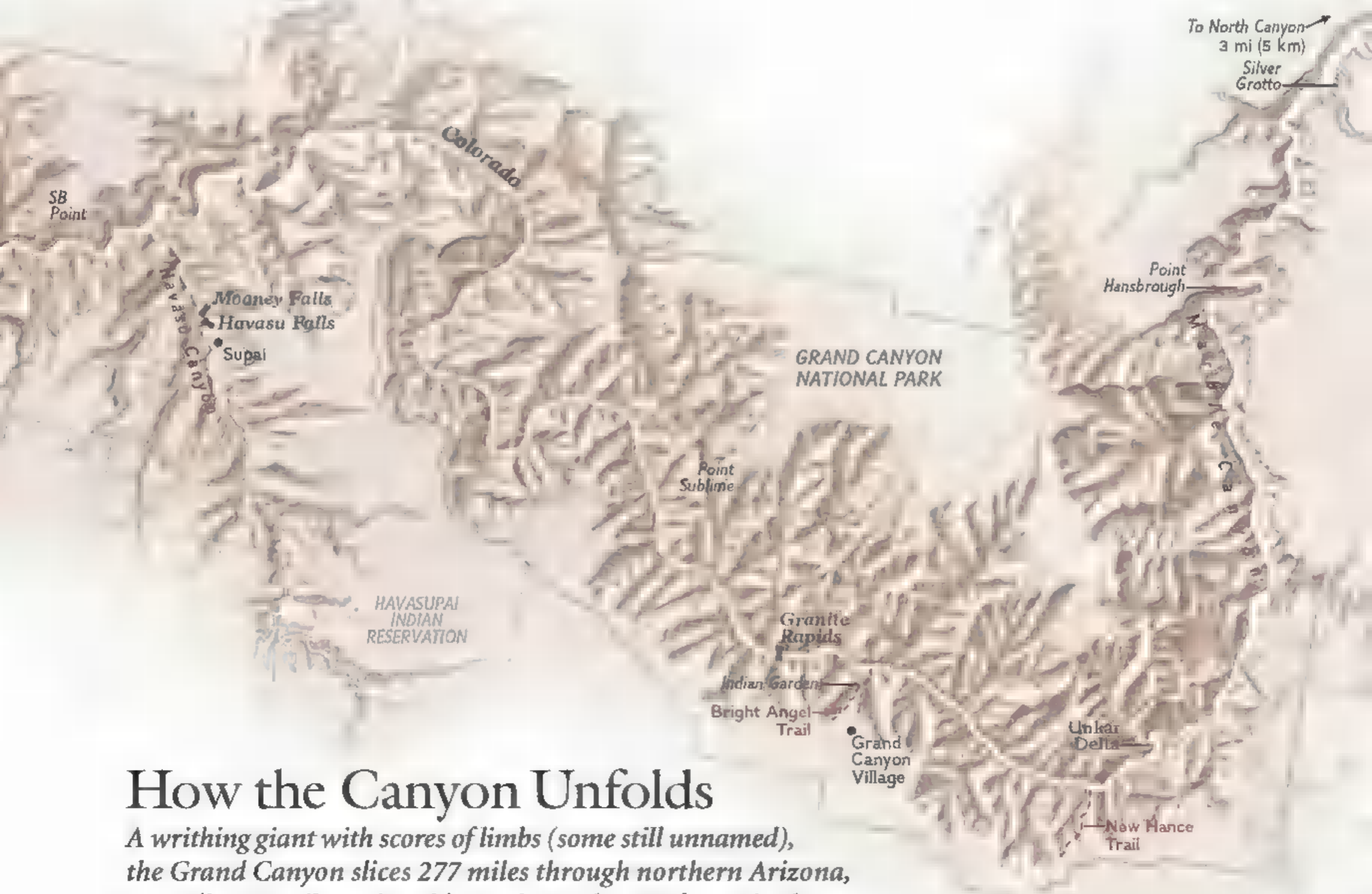
To the Hopi this canyon was *'ongtupka*, their ancestral home; to the Southern Paiute it was *puaxant tuvip*, holy land; to the Western Apache it was simply *ge da'cho*, edge of the big cliff. And for me . . . I only knew that I now stood in a place of nearly two-billion-year-old rocks. Such numbers are as humbling as the number of stars in the sky—and as hard to comprehend. But that I could reach down and touch a part of Earth that existed when life itself was a mere billion-plus years old made this big cliff land seem very holy indeed.

Above us castellated bluffs and terraces of rainbow-hued soils rose to the sky like a geological cathedral. We were dwarfs on a desert beach—but dwarfs with a princely flood of water at our feet. So we flung off our packs, dropped our trekking poles, and, surely like those first people

to reach the river's edge, plunged into the cool waters that had carved this canyon, the grandest canyon on Earth.

One night we camped on the edge of a high red wall that bellied out into the river. On the opposite shore the Colorado swept past a broad swath of beach: the Unkar Delta, site of one of the largest Anasazi settlements. There among the gravel lay stony walls, the trceries of their homes, and, nearby, pillows of plumped-up earth—the beds of their gardens. I tried squinting, narrowing my eyes so that the willows on the far shore might resemble young corn, but nothing could make up for the dryness of a garden missing its farmer.

When a park archaeologist brought Leigh Kuwanwisiwma to this site by boat, she didn't have to tell him what he was looking at. "I'm proud to say I'm a farmer," he told me, "and when I'm in the canyon, I look at all the places with a farmer's eye. And I'm always amazed, because I can see that I'm farming like my ancestors.



How the Canyon Unfolds

A writhing giant with scores of limbs (some still unnamed), the Grand Canyon slices 277 miles through northern Arizona, extending 18 miles at its widest point and 6,000 feet at its deepest—one of Earth's largest canyon systems. Cut by the Colorado River in the past six million years, it exposes rock strata that detail nearly two billion years of North America's geologic history.

I see where they put their farms and homes and granaries near the little tributaries and oases—and I think, yes, that is right, that is where a farm would be.”

Native people are, in fact, still farming in the Grand Canyon, if not in the park itself. In Havasu Canyon, a narrow side spur, the Havasupai, or Havasu ‘Baaja—“people of the blue-green water”—tend fields where they’ve lived for at least 700 years. About 450 of the tribe’s 650 members live here in the village of Supai. There are no roads or cars, so almost everyone takes the eight-mile trail in by foot, horse, or mule.

Claude Watahomigie, a slim-faced, taciturn fellow, put me on his tall piebald horse, Kid, for the trip. “Going to Mooney Falls?” he asked, since that’s the prime destination of most of the 25,000 tourists who come to Havasu Canyon. (The waterfall’s true name is Mother of the Waters; Mooney was simply a hapless miner who fell to his death there.)

“Yes and no,” I said. “I’d like to see the farms.”

Watahomigie nodded, and then his face turned blanker than a mask. He gave the horses a low whistle, and down we headed to Supai. But I’d come with the permission of the Havasupai tribal council, and slowly, reluctantly, a bemused twinkle softened his glance when I spoke.

The trail switchbacked down the rim in long, steep turns, then merged gently into Havasu Canyon. Watahomigie pulled up his horse and pointed far up the canyon, among the piñon pines. “See that bunch of wild horses? I’m planning to catch that palomino. Put him in my corral.” The horses stood in a small knot near canyon walls of beige and gold, and suddenly I wanted nothing more than to see Watahomigie catch that palomino. His desire, the wild horses, the freedom to round them up, to gallop where one’s heart called seemed as rare a thing as this canyon home.

Once, until the early 1900s, the Havasupai had also lived in the main Grand Canyon, farming an oasis on Bright Angel Trail now called generically Indian Garden. Then they were evicted; their wickiups, gardens, and peach orchards destroyed. All they had left were the 518 acres of Havasu Canyon with its turquoise streams and waterfalls. (Another 187,500 acres of canyon and rimland were returned to the tribe in 1975.)

So when someone like me, a paleface like those who did the evicting, rides into dusty

Supai, a cluster of shabby prefab buildings tucked beneath the tall cottonwood trees, people tend to look away or right through you, as Watahomigie had initially done. You are as invisible as they believe your ancestors hoped they would become.

“They wanted us to disappear, to vanish,” Carletta Tilousi told me hotly in my meeting with the tribal council. “Like the Anasazi—who they say disappeared too. Well, we didn’t vanish, and the Anasazi didn’t either. We *are* the Anasazi.”

“And the true spiritual guardians of the canyon,” added Dianna Uqualla, the council’s vice-chairwoman. “Not just this canyon, but the entire Grand Canyon. That was our home, you see. We pray every day for its protection.”

Uqualla, an amply built woman, then grasped her stout prayer stick trimmed with beads and feathers and guided me from the tribal chambers to the village outside.

Most of the tribe’s farmland is rich bottomland that borders Havasu Creek and is fenced to keep out tourists and horses. Behind the fences are the houses and peach orchards, the freshly plowed fields ready for planting, and other fields where the corn was up a good ten inches. Every house had a corral full of horses.

“Oh, yes, we’re a horsey people,” Uqualla said, when I commented on their numbers. Just then her son came trotting by on a white horse, Spirit, her two-year-old grandson balanced in front. “That horse just loves my grandson,” she laughed. The honeyed fragrance of cottonwood blossoms hung in the air, and Uqualla inhaled deeply. She’d returned that day from a trip.

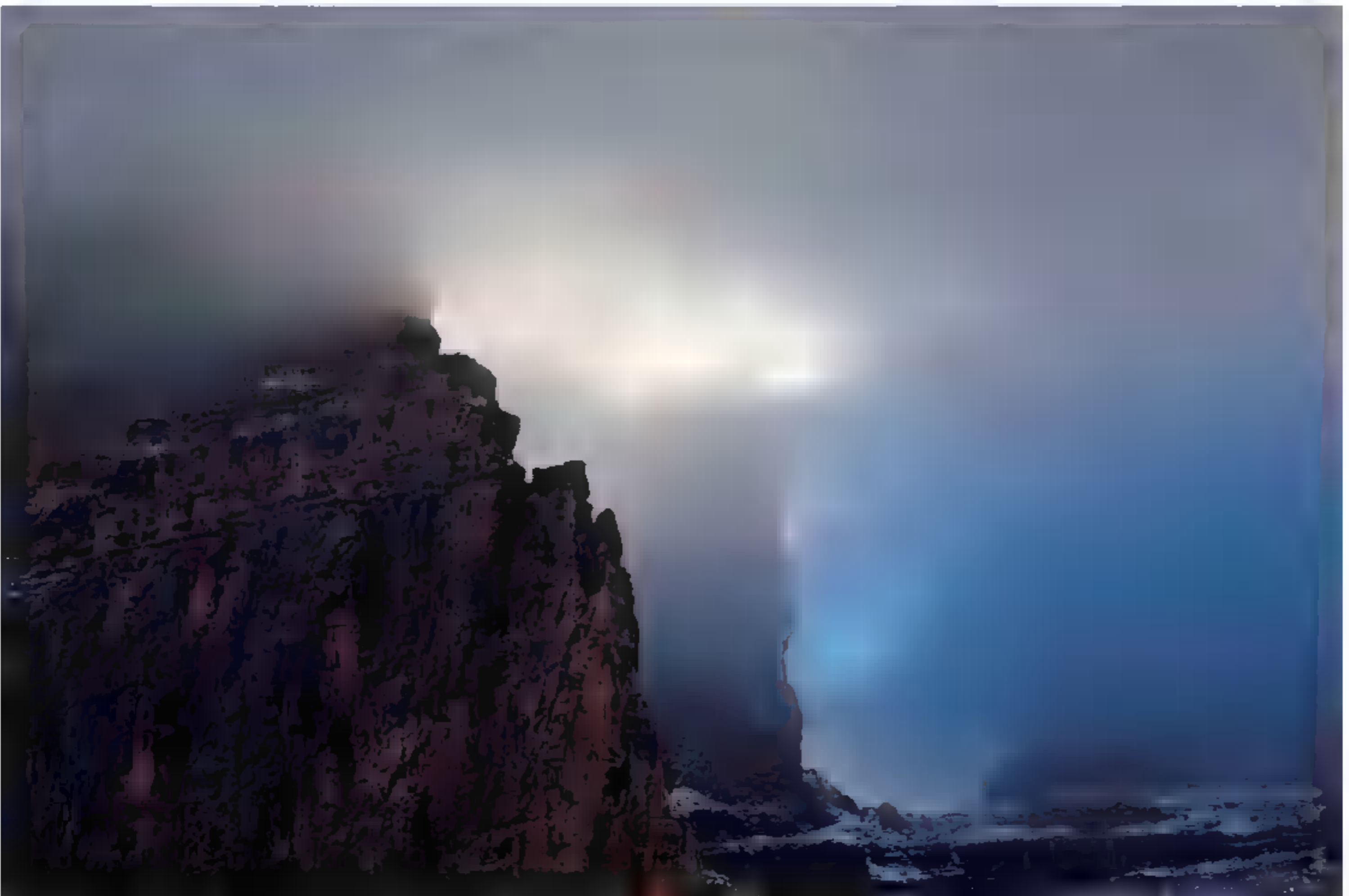
“My heart just cries for this place when I’m gone,” she said, surveying the soaring red walls that held the village and its green gardens in a close embrace. “I came around that last bend this morning and all the good scents hit me. I knew then that I was home.”

Home. The Anasazi must have felt this too, when climbing down their trails to the bottom of the canyon. There were their farms, their homes, the people and places that held their hearts. It was good to know some of them felt it still—this grand feeling of being at home in the Grand Canyon.

MAKE YOUR OWN GRAND CANYON TREK with travel tips in our Online Extra. Then download Michael Nichols’s canyon images as desktop wallpaper at ngm.com/0601.



Mooney Falls plunges 200 feet into Havasu Canyon.



Storm clouds clear to reveal frosted cliffs near Point Hansbrough.



A time exposure captures the light of moon and stars on the silty Colorado at Granite Rapids.



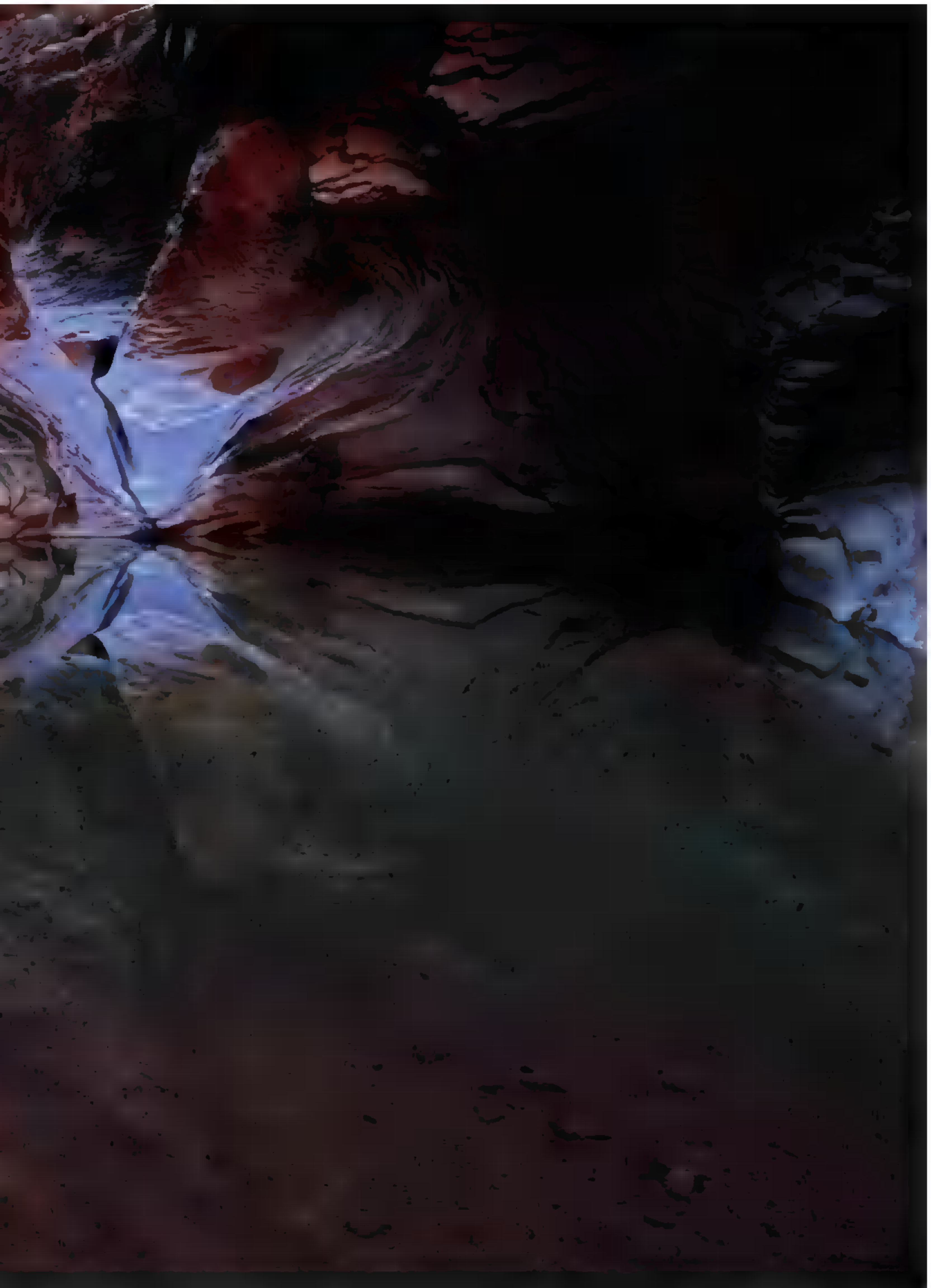


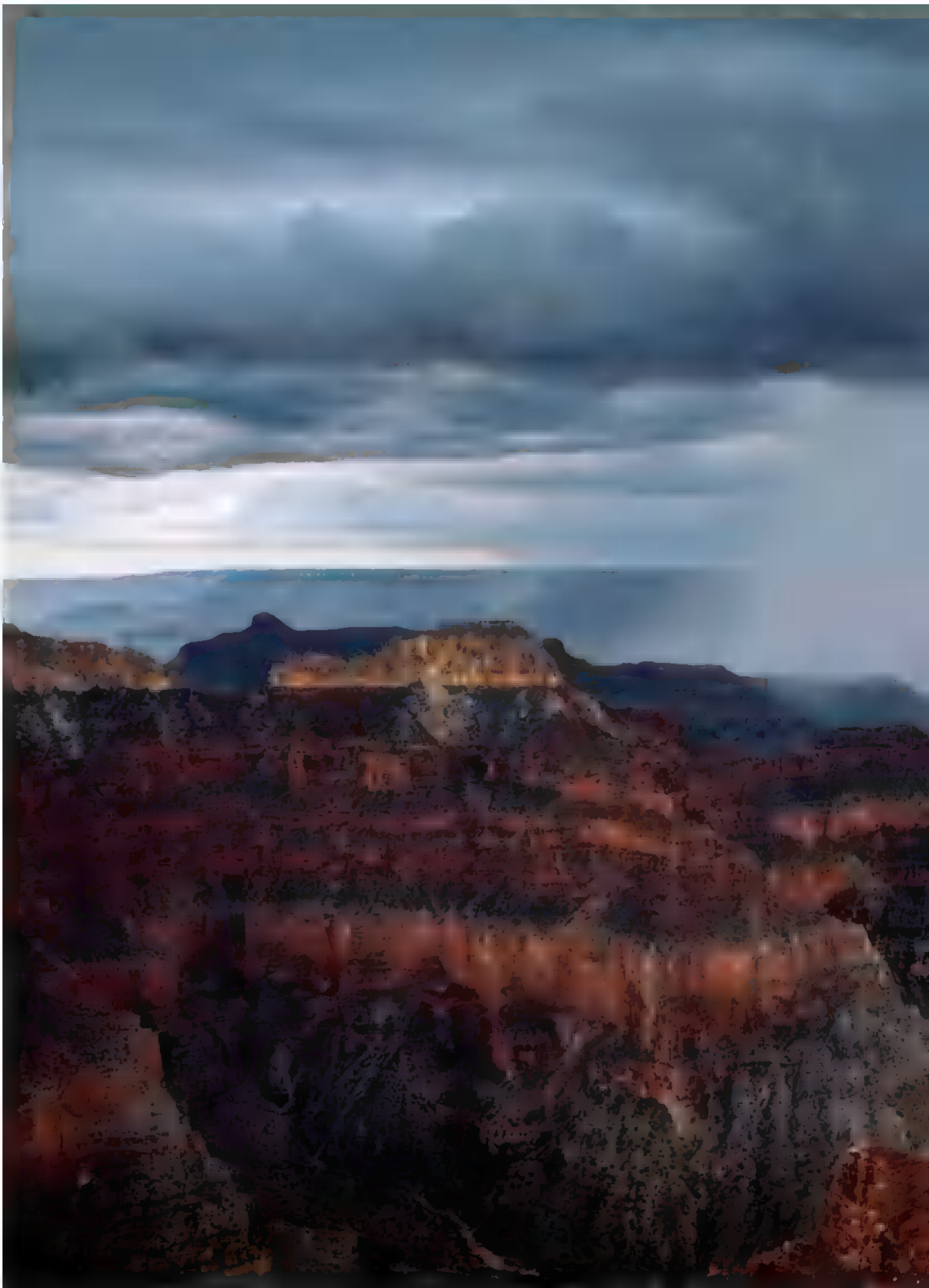
The Colorado carves through Marble Canyon, sculpted by water and time.





Pooled water reflects the sensuous curves of North Canyon.





The power to awe: Lightning arcs into the canyon's depths near Point Sublime. □







OF LYNX AND MEN

[SCENES FROM A HOMECOMING]

*A lynx in Canada, his right forefoot
caught in a snare, awaits his fate.
Captured for conservation, he'll be
set free in the Colorado Rockies—part
of a project to restore the cats to their
historic range after decades of absence.*

BY DANIEL GLICK PHOTOGRAPHS BY AMY TOENSING

[CURIOSITY CAUGHT THE CAT]

As was her habit, the three-year-old female lynx padded solo through the deep snow in the Chilkat Pass area near the Yukon–British Columbia border, prowling for prey. She spied a movement and pounced across a willow patch, but the red squirrel scampered up a tree. Then, drawn toward a compelling scent of beaver castor, catnip, glycerin, and valerian oil, mixed with herbal massage oil and infused with a couple drops of Clorox bleach, she floated on her over-size paws through the three-foot-deep snow and stepped lightly over a tree limb to investigate the smell. Dripping saliva, she chewed a branch coated with the fragrant paste.

Suddenly something gripped her leg, jolting her out of her blissful, drooling state. Bolting in fear and confusion, she leaped, twisted, and lunged for cover. Each time she moved, she dragged a cumbersome log, now wired to her left forefoot. She huddled warily, her tufted, pointy ears trained toward any sound that would reveal what awaited her.

Trapper Lance Goodwin found the lynx caught in his snare the next morning, February 27, 2000, lying in a patch of winter sun. He anesthetized her and drove her 160 miles to Whitehorse, capital of the Yukon Territory. There a veterinarian noticed a puncture wound from a stick and amputated part of the third toe on her left forefoot. Other than that she was a healthy, 17-pound lynx, just under three feet long.

Though she was caught on the British Columbia side of the border, she shipped out from the Yukon and would henceforth be known as YK00F10—the tenth Yukon female lynx caught in the year 2000 and brought to the United States. Before her odyssey was over, she would be anesthetized and examined five times, radio collared, released into the wild, recaptured, re-collared, and re-released. She would establish a new territory, meet a mate, give birth to ten

A relocated lynx begins his new life, released near Colorado's Weminuche Wilderness. Trucks, airplanes, and a snowmobile brought this male from Canada to a holding facility, where captive cats stay as long as six months. There they adjust to higher altitude and eat a high-protein diet that bolsters them for hunting in unfamiliar territory.

first-generation American kittens, and pave the way for *Lynx canadensis* to reestablish residency where her species had once hovered on the brink of oblivion.

The life and times of YK00F10 embody the agonizingly complex issues facing U.S. wildlife managers in the 21st century. Her story would



give hope to a reintroduction program that began in controversy, endured failure, and is now recognized as one of the most ambitious and thriving carnivore reintroductions in the nation.

Curiosity didn't kill Chilkat, as we'll call her (after her capture location). But it sent her on a long immigrant's journey to a new life in the southern Colorado Rockies.

Less than three years previously, in May 1997,

the plan for a lynx reintroduction took form, as many good ideas will, over a campfire and a bottle of bourbon. On a raft trip along the Dolores River, six biologists and game wardens from the Colorado Division of Wildlife (DOW) talked among themselves about animals that had disappeared in their lifetimes. They all knew the legend of the last definitive Colorado lynx sighting, an animal trapped illegally at Vail ski area



in 1973. Since then, trackers had turned up about a dozen ephemeral lynx tracks without spotting any of the reclusive wildcats. Tonight the men planned to ask their director, John Mumma, for his support in bringing the lynx back.

Timing would be important for one biological reason and one political reason. Lynx exhibit one of the most predictable prey-predator relationships in nature, especially in northern

all sorts of land-use restrictions that Colorado didn't want. But if the DOW had a lynx reintroduction program under way, maybe management would remain in the state's hands. Why not try it?

Mumma, a veteran of brutal political skirmishes from his years at the U.S. Forest Service, thought he'd left behind this kind of "sack full of rattlesnakes." Reintroducing predators was



Interstate 70 in Colorado brings outdoor enthusiasts to ski areas and vacation homes that overlap with lynx territory. Vehicle collisions and poaching have caused up to a third of the 71 known lynx deaths since reintroduction began in 1999. Some lynx released in winter died of starvation; biologists now release the cats in spring, when prey comes out of hibernation.

Canada, where they're still abundant. Every ten years the snowshoe hares that lynx depend on for most of their food go through a dramatic population rise and crash. As they starve, so do the lynx. The Canadian bunnies were now heading toward their ten-year crash in the cycle, so lynx reintroduction would need to start soon or wait nearly a decade.

The political consideration was just as pressing. Rumors were flying that the U.S. Fish and Wildlife Service was about to list the lynx as threatened under the Endangered Species Act. If the Feds listed the lynx, there would likely be

always dicey, he knew—both biologically and politically. But Westerners' attitudes about predators were changing: Public support for the two-year-old Yellowstone wolf reintroduction was running pretty darned high, and the previous year in Colorado voters had outlawed wildlife trapping and poisoning.

Mumma also knew that lynx were astoundingly beautiful and mysterious creatures. They belonged here. "OK, then," he said. "Let's do it, and let's make it work."

Armed with the chief's blessing, the group fanned out to orchestrate the lynx's return. Rick

Kahn, the DOW's wildlife management supervisor, lobbied relentlessly, both in and out of the agency, trying to convince an array of skeptics that reintroducing the lynx was a good idea: ranchers who congenitally hated carnivores, loggers and ski operators worried about development restrictions, animal rights activists, and biologists who argued that Colorado offered marginal lynx habitat. Even inside the DOW

Shenk onto the team. The lynx could not have been adopted by a more tenacious and dedicated den mother. Shenk knew that an Adirondacks reintroduction in the late 1980s had failed. But Colorado had more places where wild things still were, and the animals stood a better chance here. Or so she hoped.

The DOW contracted with Canadian trappers to bring lynx to Colorado and constructed holding pens in the southern part of the state. On January 29, 1999, the first of 41 lynx from British Columbia arrived.

["HEY, YOU'RE FREE"]

On a warm midwinter day on the east side of the Continental Divide in the San Juan Mountains, the first lynx released into Colorado didn't seem to realize how historic she was. With the press peering on, DOW biologist Gene Byrne ceremoniously slid open the door of a metal cage.

Nothing happened. The lynx sat in her straw nest inside the cage for several minutes, perhaps intimidated by the row of telephoto lenses trained on her. Byrne tilted the cage, leaned down, and spoke softly: "Hey, you're free."

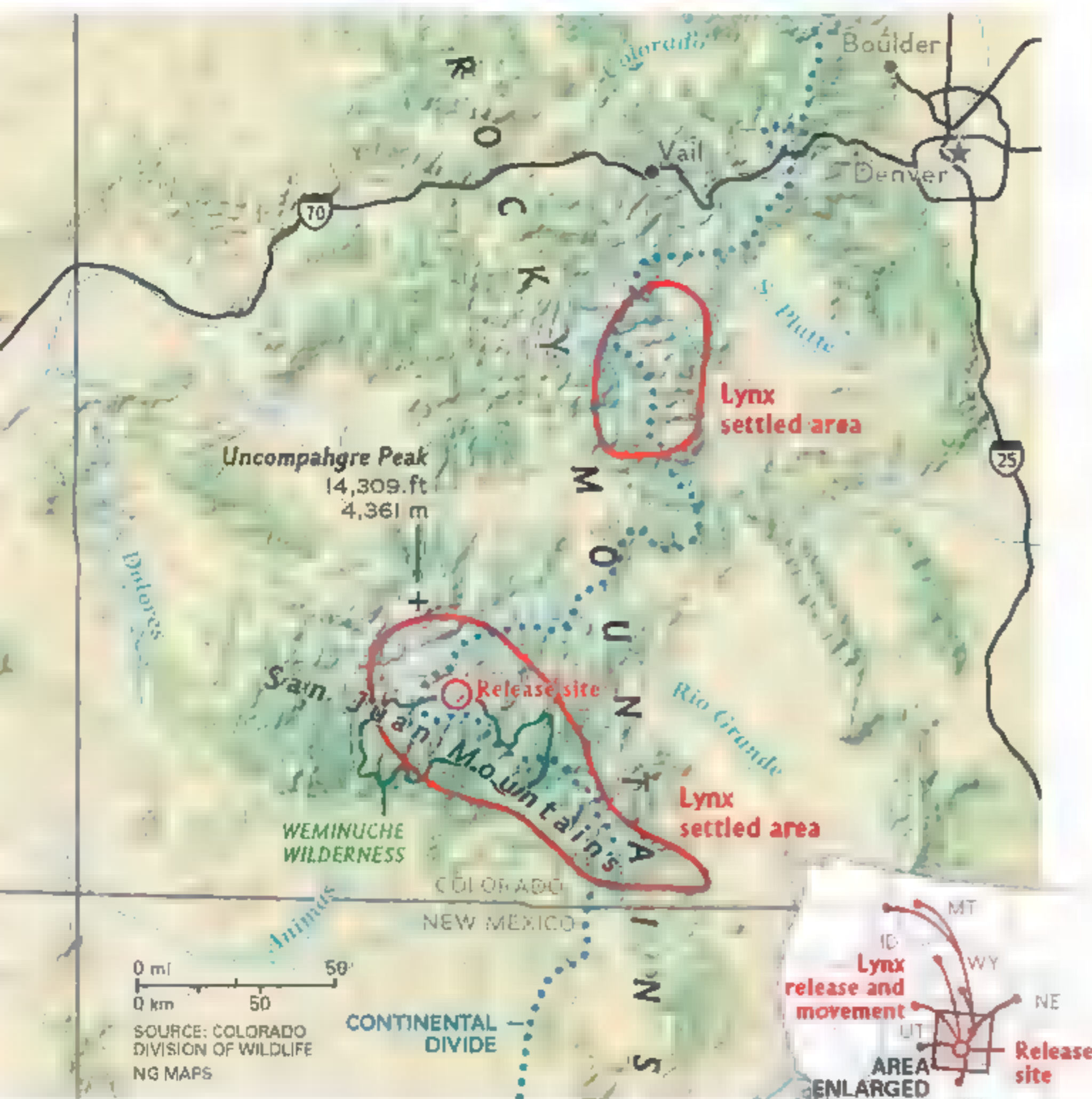
The lynx waited one moment more, then stepped out cautiously and padded through the snow into the Engelmann spruce and subalpine fir forests that would be her new home. Byrne and other DOW officials were elated. "They're back," said Byrne, red-lettering February 3, 1999, in his mind.

A second female released that same day near the headwaters of the Rio Grande was less reluctant, leaving a snow shower behind as she fled into the wilderness. The next day, one yearling male and another female followed, completing the first quartet of transplanted lynx. Reinforcements would arrive soon.

The task for these first four lynx, quite simply, was to go forth and multiply.

Instead, they died.

The first mortality signal came from the yearling male's radio collar in three weeks: no movement, dead of starvation. Two females also starved to death, and DOW officials recaptured the fourth new recruit in terrible shape. They halted new releases to re-evaluate their protocols,



Keeping Track

- 204 Lynx reintroduced (Feb. 1999–May 2005)
- 71 Known deaths
- 30 Adult lynx unaccounted for
- 103 Adults currently tracked
- 101 Kittens born over the past three years
- 7 Kittens successfully collared
- 30 Kittens known dead

some worried that the project was hastily conceived and amounted to a "dump and pray."

Finally executives at Vail, embroiled in a controversial proposed expansion of the resort, ponied up \$250,000. Kahn had argued that having a viable lynx population on the ground was better than having the Endangered Species Act hanging over their heads.

Next Kahn brought DOW researcher Tanya

A protective mother (called Chilkat by the author) defends her den from biologists hoping to handle the kittens long enough to implant microchip IDs. "Human intrusion stresses the mother," says Tanya Shenk, a project researcher, "but it's critical to mark the kittens so we know if they survive."





and the remaining Canadian cats sat in pens awaiting freedom.

The lynx team agonized. Trackers had reported plenty of snowshoe hares in southwestern Colorado. Was it that the lynx couldn't adjust to the high altitude? Were the wildcats just too high-strung to endure this kind of stress? They decided to hold the animals longer and fatten them up before release. They also decided to keep them isolated in captivity through the mating period in February and March so that no recently released females would have to deal with the added stress of breeding and pregnancy in their first months in the wild. Also there would be more prey in the spring, and the harshest winter weather would have passed.

With the new protocols in place, they released

more lynx. But more died, though only a few from starvation. By the time the releases in 1999 were tallied, 17 of 41 lynx were dead, likely killed by hunters, cars, or disease, and the program was in jeopardy.

Next year they would try again.

[WHEN CHILKAT MET LARRY]

Chilkat, who'd put on five pounds during her month of captivity, seized her opportunity to take to the woods as soon as her cage door opened. On April 2, 2000, she fled into the spruce-fir forest and crossed the frozen Rio Grande.

Thirteen other lynx were released that day. One was YK00M6, a 27-pound male captured a week after Chilkat near the town of Carmacks, also in southern Yukon. He had roomed in pen



number 19 next to Chilkat at the holding facility. Although there were strict rules against anthropomorphizing the animals, YK00M6 later earned the moniker Larry, after the smart-mouthed lynx on the Frontier Airlines commercial. Larry was a yowler.

Unlike some lynx that ended up going on long walkabouts as far away as Utah, Wyoming, and Montana, both Chilkat and Larry stayed pretty close to home. They probably smelled urine markings left by the 1999 releases—an important signpost, which those first lynx didn't have, that fellow wildcats lived in this habitat. Although lynx don't travel in packs, Chilkat and Larry crossed paths repeatedly with other lynx that spring and early the next winter.

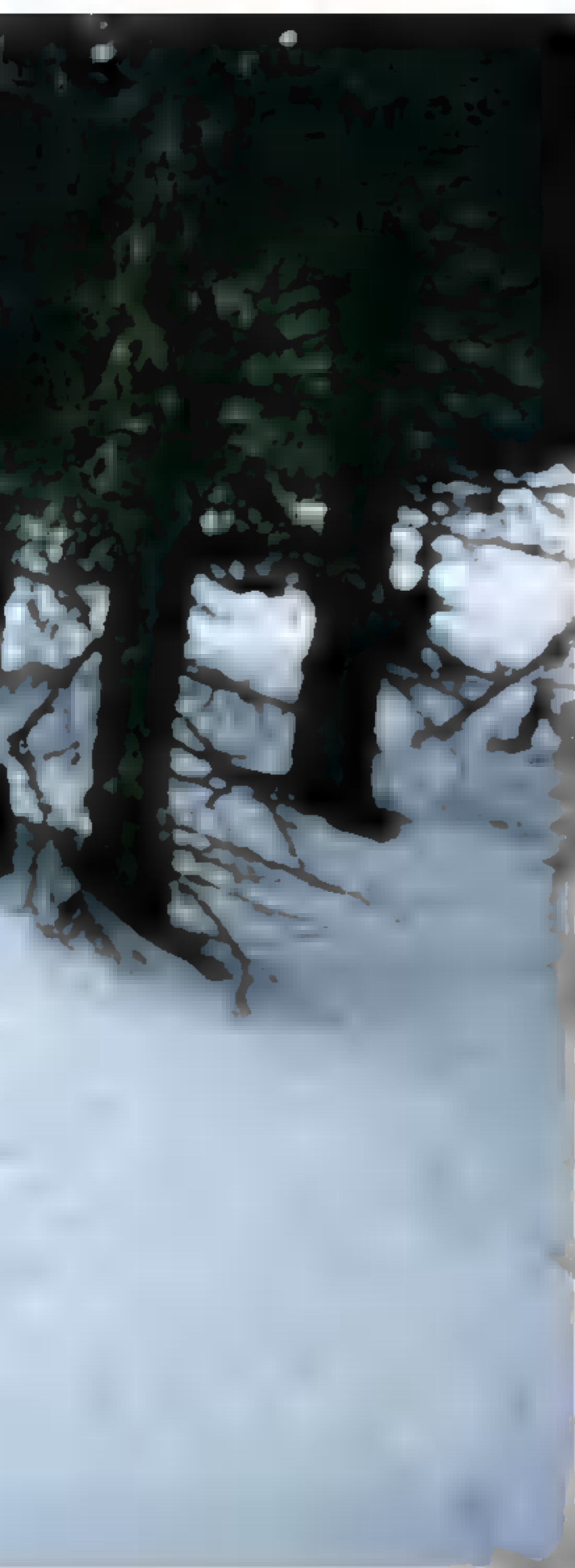
There were no kittens from the 1999 and 2000

groups, but there was evidence of decent survival rates. Then in February 2003 Larry began his mating yowls and pursued Chilkat until she accepted his advances. Six-legged tracks stretching along a 50-yard stretch of rototilled snow bore witness to their strenuous coupling.

[WE HAVE KITS]

Tracks on the ground and aerial reconnaissance in February and March indicated that several possible mating pairs had found each other at the critical time. Then the DOW lynx team caught a break. Bob Dickman, riding in the copilot's seat of a Cessna 185 and holding a receiver that could pick up the radio collars' VHF signals, was looking out for females that had stayed in the same spot since his previous flight.

The task for the first four transplanted lynx, quite simply, was go forth and multiply. Instead, they died.



Researcher Clay Miller (left) takes a just collared ten-month-old back to her cage, where she'll wake from anesthesia. Once kittens grow large enough to become independent, they are collared and tracked. A mother will move her litter (above) when humans come near, so biologists limit their work with newborns.

In late May he finally got such a signal and immediately radioed Shenk, who was coordinating ground crews ready to swoop in. "She's either dead, or she's in a den," Dickman said. Shenk and her team headed toward Dickman's coordinates. It was a den, with two kits inside.

After that, a kitten deluge. The third den they found was Chilkat's; she'd given birth to the only kit quartet. After documenting Chilkat's litter, Shenk and her team raced from den to den, recording other kits' weight and sex, and placing an identity tag just under the skin between their shoulder blades. "We turned into kitten junkies," says Shenk. "We were just flying."

At the summer solstice, 16 first-generation Colorado lynx kits had their pale blue eyes open to their new home. "There's nothing like a kitten in your hand to say success," says Shenk.

By the time the first snow fell that fall, two of Chilkat's four kits had perished—possibly killed by coyotes or plague. But she and her two survivors roamed the woods together, hunting snowshoe hares. The trio moved with ease up steep, snowy slopes, napping nestled in shallow day beds in the snow. They followed snowmobile tracks and crossed roads, alternately stalking, pouncing, eating, playing, and sleeping.

By the following February, Larry's yowls reminded Chilkat that mating season had begun, and she sent her kits off on their own. In June she returned to the same log where she had made her first Colorado den and gave birth to two more kits. The 2004 denning bonanza more than doubled the previous year's lynx crop: Shenk and her team documented 39 new Colorado felines.

[KEEP 'EM COMING]

Last summer Chilkat gave birth to four more kits. But many obstacles remain for the Colorado lynx. The number of people in the state has doubled since the last known lynx was killed in 1973, bringing more development, more recreation in the forest, and more traffic. Still, the trend lines for the Colorado immigrants are

Wide, harelike paws help a lynx skim through deep snow without sinking in, a crucial trait for hunting quiet prey such as snowshoe hares. Transmitters on a radio collar signal the cat's location and reveal whether it's still alive.

encouraging: 46 kits were documented last year, and there's a high likelihood that some uncollared females have also given birth. The DOW accounted for at least 170 surviving lynx overall, and successful repeat breeders like Chilkat show every indication of continuing the trend. Chilkat's 2004 kits were radio collared early last year and stand poised to give birth to a second-generation lynx crop this year in June.



“We need the kittens to have kittens,” says Shenk.

The plan now is to release about a dozen new lynx each year for the next three, but, Shenk says, “It’ll be 15 or 20 years before we can say it’s a success. We’re not home free yet.”

After Shenk and her team left Chilkat’s den, the lynx took each of her four kittens by the scruff of the neck and moved them to another site. From the new den in the southern Rockies,

hidden in the fallen timber of a north-facing slope, she would begin to teach the kits how to stalk, pounce, and make a living in their native land of Colorado. □

LIVING WITH LYNX Zoom in on more images in a photo gallery, go on assignment with Daniel Glick and Amy Toensing, and get an update on some of the story’s main characters at ngm.com/0601.



The Dawn of MAYA GODS and KINGS




New discoveries from the Guatemalan site of San Bartolo, including a sacred mural and a royal burial, show that the lords of heaven and earth were in full command more than 2,000 years ago.

THE EARLIEST KNOWN PAINTING OF THE MAYA'S CENTRAL RELIGIOUS MYTH DEPICTS THE MAIZE GOD, PATRON OF KINGS (RIGHT). A GREEN STONE FIGURINE (ABOVE) WAS FOUND WITH OTHER ARTIFACTS IN THE OLDEST KNOWN MAYA ROYAL TOMB.





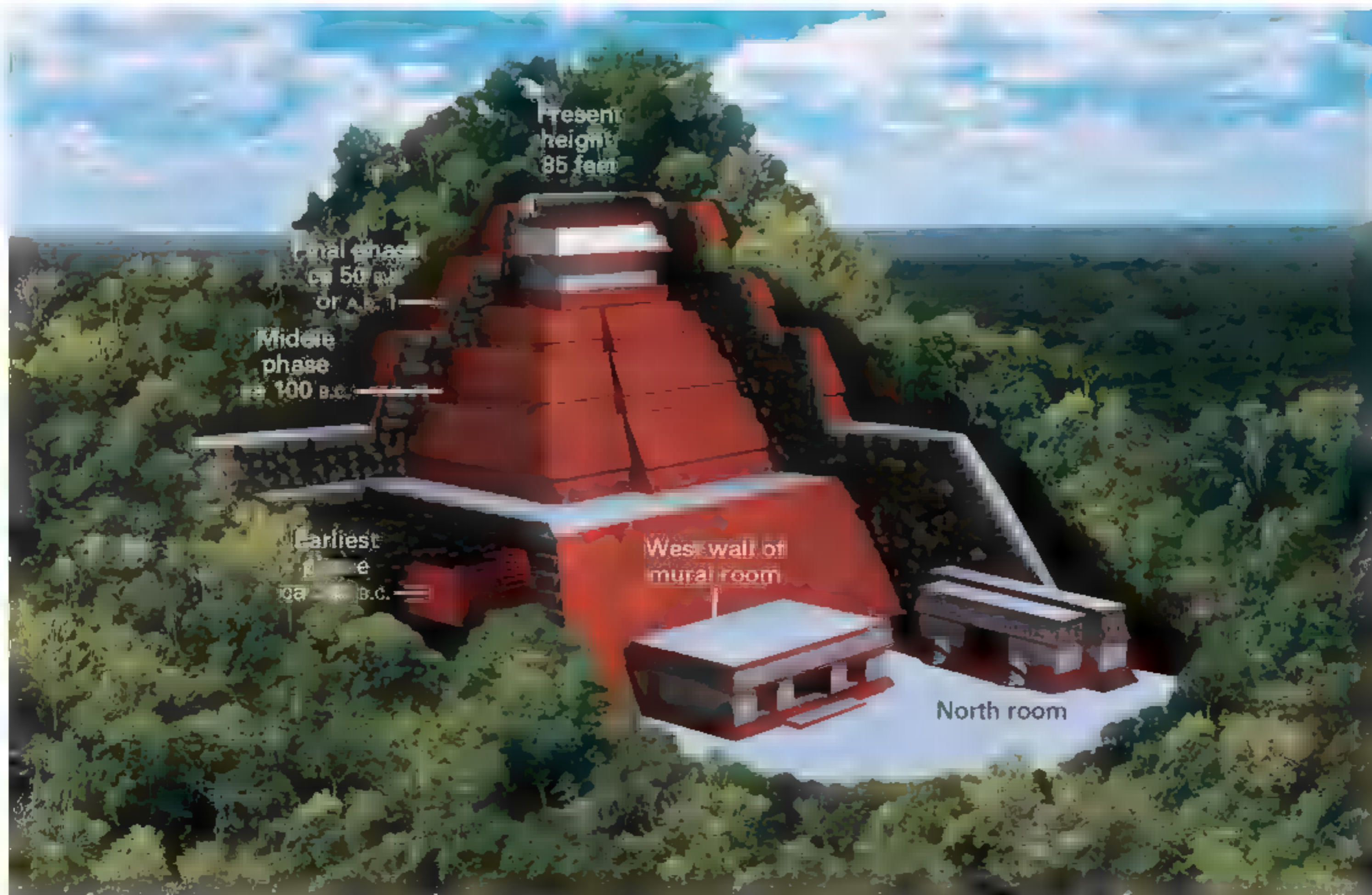


A man wearing a plaid shirt and glasses is working in a dark, narrow tunnel filled with rubble. He is leaning forward, focused on his task. The tunnel walls are made of rough, uneven concrete and brick, with some areas showing signs of damage and debris. The lighting is dim, highlighting the textures of the rubble and the man's concentration.

DANGEROUS WORK Digging around a building buried in rubble, project director Bill Saturno hands a fallen piece of the painted wall to tunneling expert Humberto Amador. The team worked bigger rocks loose with a hefty pry bar, Saturno says. "Getting one rock started without others catching on is the trick."



TWO FINDS Archaeologist *Mónica Pellecer Alecio* takes a stone figure from the oldest known Maya royal tomb, from about 150 B.C. The burial lies on San Bartolo's west side, linked with sunset—and death. To the east, archaeologists found two rooms from 100 B.C., beside a pyramid hidden by later construction (below). One room holds the earliest preserved Maya mural, chronicling divine and royal deeds.



ART BY VLAD DUMITRASCU

THE TWO ARTISTS worked by torchlight and morning sunshine. Perhaps they were twins, like the twin artist-scribes of Maya myth, although their styles were distinct. Certainly they had trained for their task since youth, copying images and text from the accordion-fold books that held the sacred stories. Now, under their brushstrokes, the gods and their acts of creation burst to life on polished plaster.

Spanning at least two walls of a room at the base of a pyramid, the result was a masterpiece with two purposes: to honor the gods and to illustrate the divine right of a king. The first made it timeless; the second, short-lived. After only a few decades the room was buried beneath a larger pyramid, a monument to a new ruler in the ancient city we know as San Bartolo. There the paintings remained, hidden in the Guatemalan jungle, for more than 2,000 years before those divine faces again met human eyes. I was the fortunate one to uncover the mural, which reveals not only the great antiquity of Maya painting but also the long endurance of the Maya stories of creation.

The project began in March 2001 with a stroke of pure luck, when I ducked into a trench looters had cut into the pyramid. My gaze fell on the face of the maize god looking over his shoulder at a beautiful maiden. I longed to see the rest of the mural, but it took two years of planning to ensure that further excavation wouldn't damage it. In March 2003 I began to dig a narrow tunnel inside the mural room, paralleling its longest remaining wall. I left a veneer of mortar and stone covering the paintings to protect them. When the tunnel was finished, I began to chisel away the remaining stones.

It was as if an ancient Maya book had been spread open before me, recounting the

birth of the Maya cosmos from the gods' loins. Aspects of the story were familiar from two much later manuscripts: the 13th-century Dresden Codex and the 16th-century *Popol Vuh*. But these paintings, more than a thousand years older, told the same tale—with startling grace and sophistication. Clearly Maya painting had achieved glory centuries before the great works of the Classic Maya, in the 7th century. In Western terms, it was like knowing only modern art and then stumbling on a Michelangelo or a Leonardo.

The far end of the mural held another surprise. Some scholars thought that at this early stage in Maya history, the Preclassic, city-states had not yet evolved into full-fledged monarchies, with all the trappings seen later. But here was a king, named and titled, receiving his crown. In short, this one chamber upended much of what we thought we knew about the early Maya.

Almost a mile west of the painted room lay an actual king—the earliest known Maya royal burial. Last year Guatemalan archaeologist Mónica Pellecer Alecio dug beneath a small pyramid and found signs of a sealed tomb. Hearing rumors of looters working only five miles away, her crew excavated 24 hours a day, sleeping in shifts.

Just after 2 a.m. on the third day, 20 workmen used a giant wooden lever cut from the forest to wrest away the heavy capstones. Beneath lay the bones of a man, with offerings including a delicate frog-shaped bowl and a vase bearing an effigy of Chac, the rain god. On the man's chest rested a concave jade plaque—a symbol of Maya royalty.

After 2,000 years, the power of the ancient gods and kings seemed intact: Just as the team removed the dead king's Chac effigy, the clouds opened and the region's worst dry season in a decade came to an end.



Blood Offerings and a King's Coronation

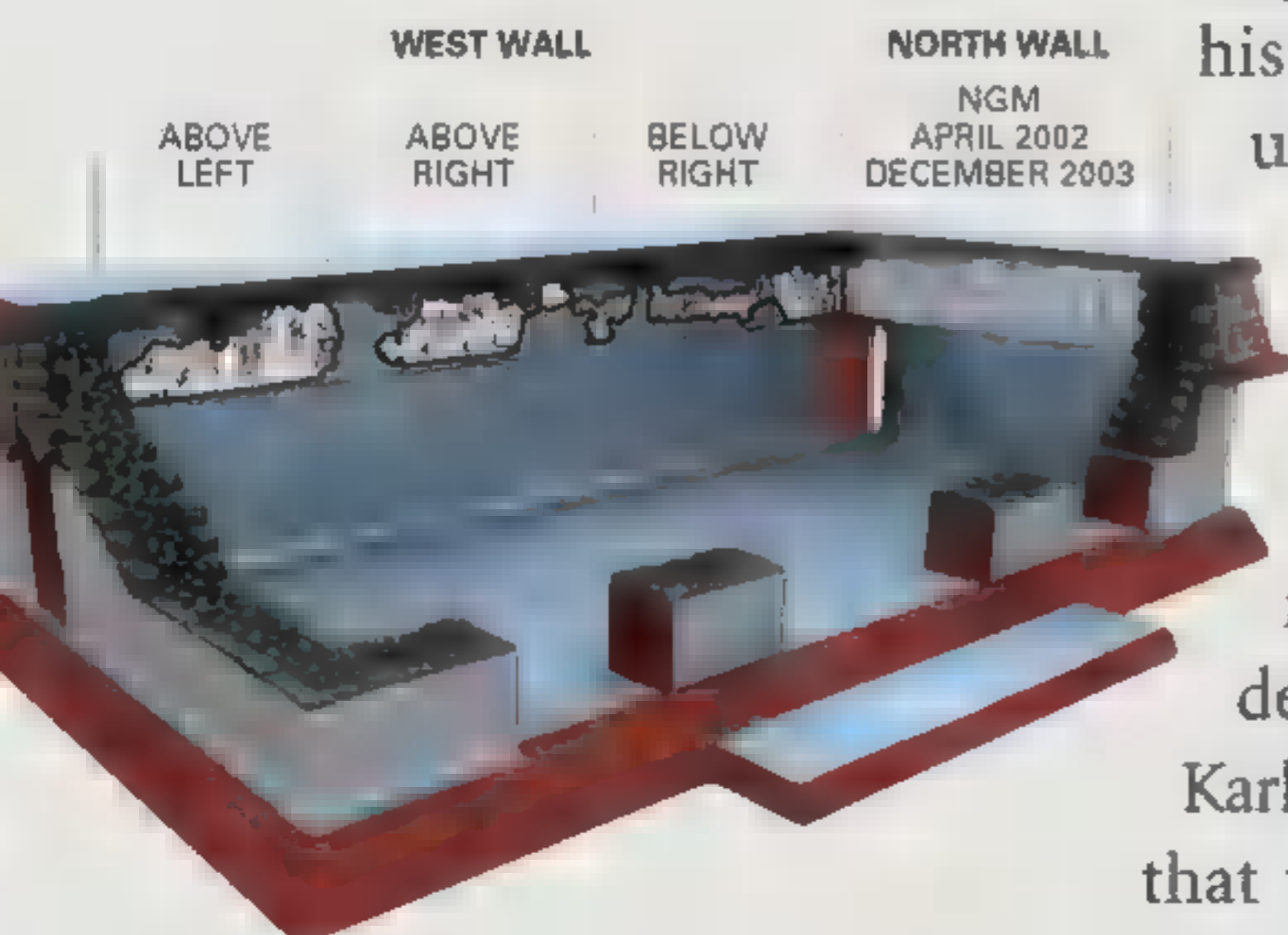


First God Fish Sacrifice First Tree Second God Deer Sacrifice Second Tree Third God Turkey Sacrifice Third Tree

Birth of the Maya Cosmos

Five sacred trees helped connect earth and sky in the ancient Maya cosmos, with one tree in each of the cardinal directions and one at the center. The San Bartolo mural shows five deities—each standing before one of these sacred trees—as they bring order to the world.

Beginning on the left (above), each of four gods pierces his penis, spilling sacrificial blood before an offering unique to him. The first offers a fish, which represents the watery underworld; the second a deer, representing land; and the third a turkey, representing the sky. The fourth deity offers fragrant blossoms, the food of gods in the flowery paradise where the sun is reborn daily. Perched in each sacred tree, the great bird deity oversees the gods' sacrifices. Project iconographer Karl Taube of the University of California, Riverside, notes that the same sacrifices—performed by a priest—appear in a Maya manuscript from more than a thousand years later, the 13th-century Dresden Codex, proof of the long continuity of Maya religious symbolism. Little remains of the fifth god, to the right of the sacrifices, but he appears to be the maize god, one of the principal deities of the Maya,



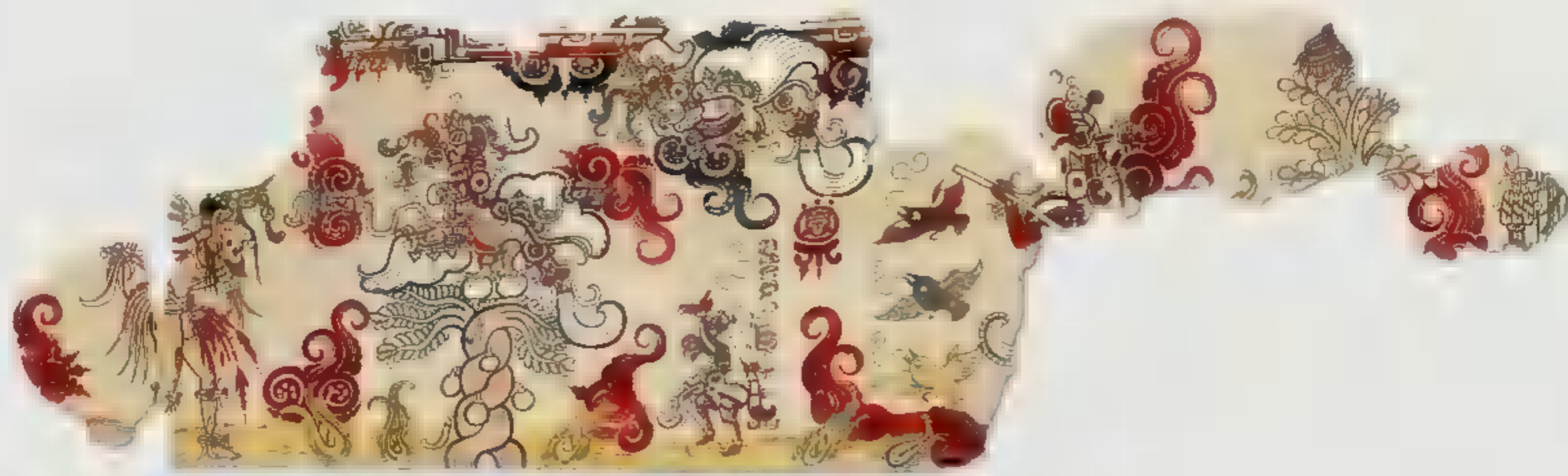
Excavation of the mural room began at the north wall—described in two earlier articles—and now has uncovered the west wall. Piecing together fallen fragments with what remained on the wall revealed themes central to Maya beliefs for more than two millennia.



Maize God Crowning Himself as Ruler

Divine Right of a King

MURAL RECONSTRUCTIONS BY HEATHER HURST; ART BY VLAD DUMITRASCU (ABOVE)



Fourth God

Fragrant Blossoms

Fourth Tree

Maize God

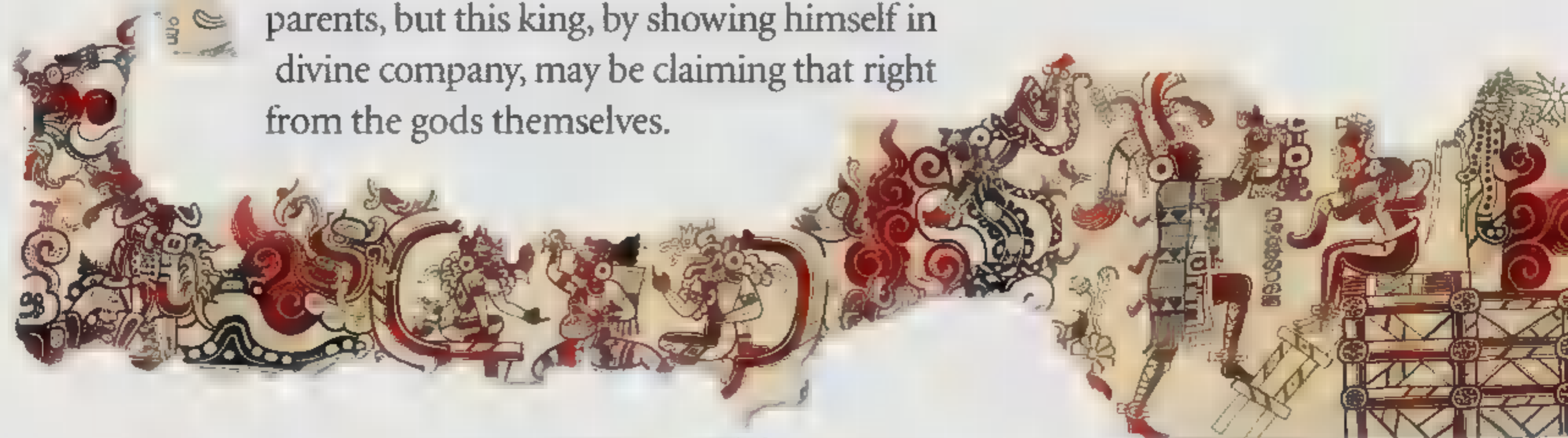
Fifth Tree

who is often associated with the center of their universe.

To the Maya, Taube believes, these five gods accomplished on a cosmic scale what kings did in real life. Just as the gods organized the cosmos, kings brought order to towns, buildings, and fields—all four-sided like the cosmos.

The second part of the mural (below) likely celebrates the accession of a real king. The narrative shows the maize god crowning himself as a divine ruler and traces his life, death, and rebirth, which parallel the agricultural cycle. First we see the infant god, born of water, in the arms of another deity. The growing god dances from the turtle-shaped earth between the gods of rain and surface water, then dives back into water in death. In a final scene, the Maya king receives his headdress from an attendant.

Later kings claimed the right to rule from their parents, but this king, by showing himself in divine company, may be claiming that right from the gods themselves.



Infant Maize God

Rain God *Growing Maize God* *God of Surface Water*

Turtle-shaped Earth

Dying Maize God

Attendant

King Is Crowned



THREE SACRIFICES *A deer, a god's blood, and a turkey are the offerings in a composite of 42 digital scans from the mural. Bill Saturno was using an ordinary flatbed scanner to record mural fragments in the field lab when he wondered if he could scan the scenes still in place. Crawling along the wall, he turned the scanner on its side and held it against the painted plaster. "It made a horrible noise, but the*



image was gorgeous," he says. "I thought, Yeah! We're on to something." Taking some 350 scans, he created a mosaic of the full mural. In just hours, the project artist produced ■ scaled-down version that re-created original colors and lines. About 2,000 fragments have yet to be scanned and could reveal vivid new surprises. □

■ **PHOTO GALLERY** See more of this sacred mural and offerings from ■ Maya king's tomb at ngm.com/0601.

Cracking the frigid air
with a sealskin whip, a
Greenland hunter urges his
dogs across sea ice that gets
thinner and less stable each
year. Out here he's always
found game for his family
—until now. The problem:
The ice is disappearing.



Last Days of the



BAFFIN BAY, GREENLAND

Ice Hunters?



By Gretel Ehrlich
Photographs by David McLain

**“This isn’t our weather,”
Jens says. “It belongs
to somebody else.”**

Jens Danielsen kneels on his dogsled as it bumps through the glinting ruins of a frozen sea. “*Harru, harru,*” he calls out. “Go left, go left.” “*Atsuk, atsuk.* Go right, go right.” His voice carries a note of urgency. The 15 dogs in his team move warily, picking their way between lanes of open water and translucent sheaves of upended ice. Despite bitter cold in late March, the ice pans have shattered, making travel dangerous.

In a normal winter the ice comes to northwestern Greenland in September and stays until June. But during the past few years there have been only three or four weeks when the ice has been firm and the hunting good. “The sea ice used to be three feet thick here,” Jens says. “Now it’s only four inches thick.”

As big as a bear, with a kind, boyish face and an elegant mind, Jens is a 45-year-old hunter from Qaanaaq, a village of about 650 people at latitude 77°N whose brightly painted houses climb a hillside overlooking a fjord. Along with his brothers-in-law, Mamarut Kristiansen, Gedion Kristiansen, and Tobias Danielsen, who

each has his own dog team and sled, he’s heading toward the ice edge on Smith Sound to find walruses, as hunters have done for as long as memory. With 57 dogs to feed, as well as his extended family, he’ll need to kill several walruses on this trip to bring home any meat.

Before leaving Qaanaaq, Jens had studied an ice chart faxed from the Danish Meteorological Institute. It showed vast areas of open water all the way to Siorapaluk, the northernmost indigenous village in the world. This was bad news for the hunters, who planned to travel on the “ice highway” for as long as a week. And it was a grim sign for the ecosystem as well, since it reflected the warming trend scientists call the polar amplification effect. During the past few decades temperatures have risen in Greenland by more than 2°F—twice the global average—and the island’s massive ice sheet, almost two miles deep in some places, has been melting faster than at any time during the past 50 years. As the ice and snow cover melt, the Earth absorbs more heat—and sea levels rise everywhere.



Heart of a Hunter

Avigiaq Kristiansen, 15, left school to hunt. In 2004 he killed his first polar bear. Now his teachers are older hunters, including Jens Danielsen (opposite, second from left). "He has the will to be a great hunter," says Jens. "All we can do is teach him what we know."



Dogs Eat First

Getting a Siberian husky prepared to sled for his owner like huskies do is a mix of the traditional—over-baiting, leading home, and a few basic tricks—plus helpful human survival lessons. Learning outdoor survival for huskies “can be not applied to any dog,” says a Siberian husky. Huskies have a strong sense of direction, and a strong





Arctic Mobile Homes

Jens, Gedion, and other hunters of the region travel with tents but often take refuge in plywood huts like this one outside Qaanaaq. These shelters are built in villages and towed by dogs to prime hunting areas. When possible, each hunter leaves meat for the next.

Arctic biologists say that the entire ecosystem is in collapse. Without sea ice, seals can't build ledges on which to rest, eat, and bear their pups. Walruses can't find refuge on drift ice to rest and digest their meals of clams and other shellfish. Polar bears can't catch seals if there's no ice. And hunters like Jens can't travel in search of game.

H*uughuaq, huughuaq*—Get going, go faster!” Jens calls, encouraging his team. His sled is 13 feet long and 4 feet wide, pulled by 15 dogs in a fan hitch that lets

them navigate the rough ice independently.

“These dogs are half wild,” Jens says. “Maybe we are too. They have to be a little hungry to keep working for us, and we have to be hungry to keep going out with them.”

The sled tips and tilts as the dogs scramble and bark. A fight breaks out, and Jens snaps a whip over their backs until they pick up speed. When a line in the fan hitch snags and a dog is dragged, Jens leans forward, without stopping, plucks at the tangle, and the dog's leg is released.

As we weave between stranded icebergs, Jens clamps his huge leg over mine and grabs my shoulder to keep me from falling off the sled. After one jolting bump, he raises his eyebrows to ask if I'm all right, then laughs when I nod yes. We've traveled together many times since 1996, when he first allowed me to accompany him on spring hunts for little auks, beluga whales, ringed seals, and walruses, so there's no need for words.



By the time the light fades about 11 p.m., we head toward shore and the hunters make camp on a rocky beach. Everyone's in high spirits. Where there had been open water a week earlier, now ice has congealed. Perhaps hunting will be good after all.

Dogs are unhitched and tied to notches cut in the ice. Sleds are unloaded. Two small canvas tents are put up using harpoon shafts as tent stakes. In each tent two sleds lined with reindeer skins serve as sleeping platforms. The floors are ice. An ancient Primus stove is lit. Overhead a sealskin thong is hung with sealskin boots, arctic hare socks, and a loaf of bread to be thawed. In a battered pot teetering over the flame, a spangled piece of glacier ice becomes water.

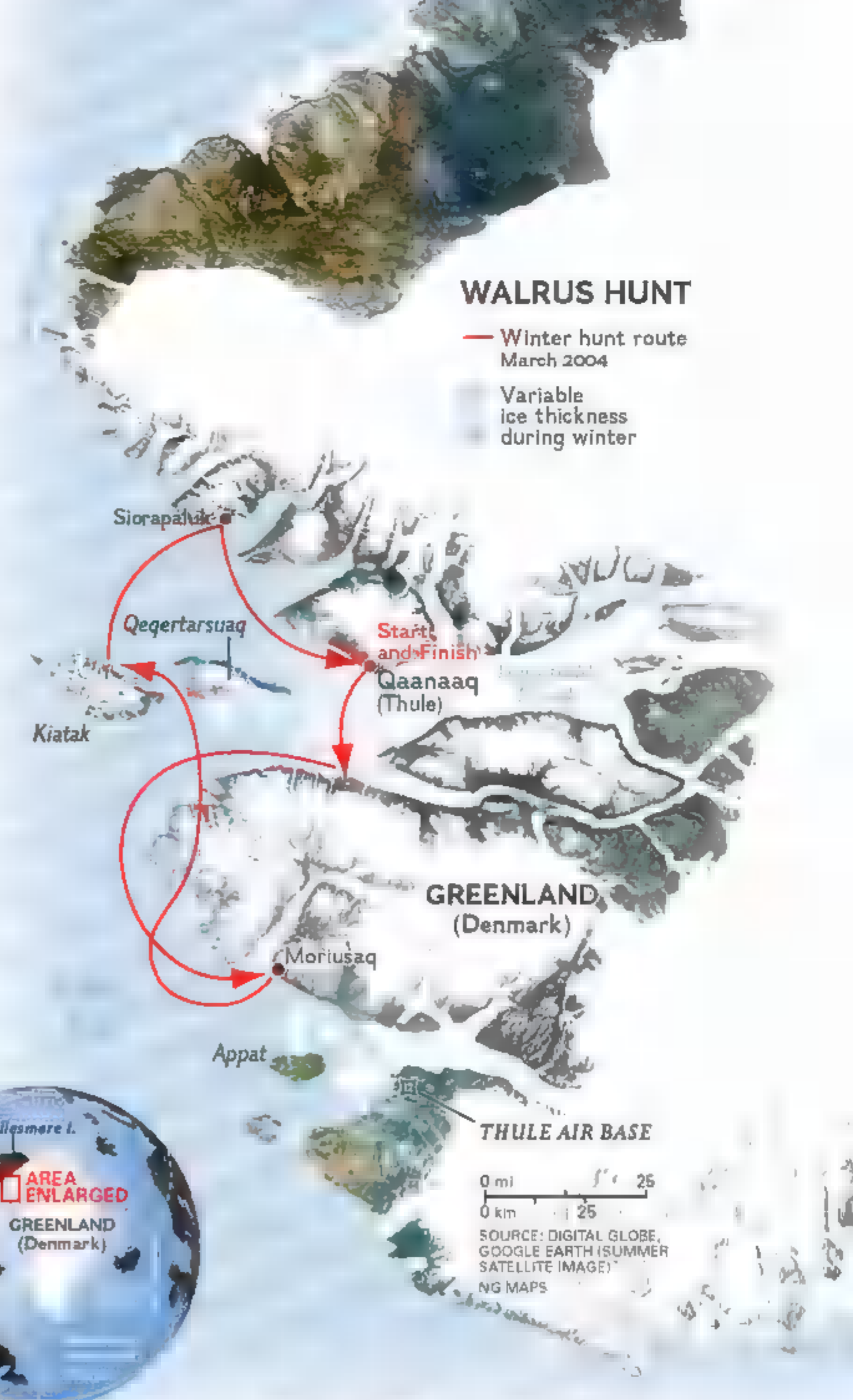
"Aurrit—walrus!" Jens sings out. "There will be many out there," Mamarut says, meaning a few miles out at the ice edge. The hunters prepare for an all-night hunt, changing out of fox-fur anoraks into

ones made of lined canvas with polar bear fur at the wrists. Jens sharpens his knives as Gedion coils green harpoon lines. "We're going to the ice edge, the place where winter becomes spring," Jens says.

About midnight the fading sun is a red orb hanging at the horizon. As darkness bleeds into it, the temperature plummets to minus 40°F. Night will be brief—in a few hours the sun will swing east again.

Harpoons in hand, the men line up single file and begin walking. Mamarut leads, Jens and the others follow, careful to place their feet into Mamarut's track. "The walrus can hear us moving over the ice, so we must make it sound like we are just one hunter," Jens whispers.

We walk for an hour in our silent Ice Age procession. These men are among the last hundred or so Greenland hunters who have chosen to keep their ancient traditions alive—traveling by



Hunting on Thin Ice

During the hunters' journey (map) thin sea ice foiled several attempts to reach the ice edge—a nutrient-rich biological zone where animals come to feed, including seals, walrus, and polar bears. Scientists say global warming is contributing to the disappearing ice. If trends continue, the Arctic Ocean could be ice free each summer by the end of the century.

dogsled, wearing skins, hunting with spears and harpoons, while taking what they want from the modern world, such as rifles. Their ancestors came to Greenland about 800 years ago, the most recent wave of peoples who migrated from Siberia beginning some 5,000 years ago.

"We hunt with harpoons, but we also use cell phones and watch TV," says Jens, who has testified before Greenland's Parliament to keep snowmobiles out of the far north. New ice—ice that has just refrozen—undulates like rubber beneath



our feet. A slender channel of water appears, its crenellations catching and dropping the last of the sunlight. “The ice edge,” Jens whispers. He points: “*Miteq!*” Two eider ducks fly out of a maze of sparkle.

Mamarut motions for us to stop. We hear gulping and sloshing: Walruses coming. They bob up and down, their ivory tusks gnawing

“We’re going to the ice edge,
the place where winter
becomes spring.”

frigid water. Mamarut breaks out of the procession, crouches, and runs ahead to the edge of the lead. We wait motionless. There’s the whir of a harpoon, then a gunshot. The walrus is dead.

Harpoon lines are tied to long iron poles. A modern block and tackle is attached and the four men line up, hauling the young 800-pound male onto the ice hand over hand. Knives are resharpened. Penis and flippers are cut off. Heart and liver are laid on a tarp along with the other meat—food for both humans and dogs.

Jens walks back to camp and returns with a sled, his rolling side-to-side gait like that of a polar bear. He cuts a tangle of guts into long lengths and feeds

the hungry dogs. The rest of the walrus is dismantled and stacked on the sled. Later he leans over a bloody mass on the snow—the stomach slit open—fishes around in the brown liquid with his knife, then stabs. A scallop! “Umm,” he says, smiling, offering it to me. I shake my head. He pops the scallop in his mouth, chews, and swallows.

Before leaving, Mamarut lays two ribs and a

pile of steaming intestines on the ice. “For *nanoq*,” he says, the polar bear. “He is teaching us all the time. He can move on water or ice equally and hunt anything. He is worth our

admiration. Without knowing the polar bear’s ways, I would have died out here many times.”

As the last of the meat is stacked, steaming, Jens hooks his dogs to the sled, and Mamarut stops to look skyward. “Sometimes we’re lucky, and other times things go against us, and we don’t get anything to eat,” he says. “Our lives are based on how nature gives us animals.”

March 21, the vernal equinox and our fourth day on the sea ice, a front moves in, and the temperature drops again from minus 35°F to minus 40°F. “We need to go quickly before the storm hits,” Jens

warns. Rushing to load the sleds, the men kneel on flapping reindeer skins, pulling the lash ropes tight. The dogs are wild-eyed. The moment they feel the lines hitched to the sled, they take off. With flying leaps, the hunters barely make it aboard.

Out on the frozen sea the ice is smoother between wind-driven snowdrifts. We follow the mountainous coastline south toward the village of Moriusaq and the place the hunters call Walrus El Dorado near Appat Island, where last year they killed 13 walruses in just a few days. Ocean currents have squeezed and shattered plates of ice, and our sled comes to a halt. Stopped by the laby-

rinth, the dogs moan and cry. Which way do we go? Jens looks and shrugs, smiling. Then, using his enormous strength, lifts the front of the sled—freighted down by 800 pounds of meat and gear—until it points the other way. The dogs lurch forward, and Jens hops on as we bump through a narrow passage.

We travel for hours against a hard wind. It's too cold to stop and let the dogs rest, and the storm is coming in fast. Ice fog has lowered itself to the ground. We're headed for one of the wooden huts the hunters have built on the coastline for shelter during storms. A single pointed mountain protrudes through the fog. "*Iviangeq!*" Jens yells to Mamarut, whose sled comes alongside ours. He laughs and makes a cupping gesture to indicate a woman's breast. Ahead the roof of a tiny hut pokes from a snowdrift. The sled shudders as the dogs careen toward it onto land.

The traditional low entryway is dug out; shuttered windows are opened. Laughing, Gedion kicks the wall with his feet because there is no feeling in them. My hands are numb from the wrist forward. Two Primus stoves are lit, and Jens holds my fingers over the tiny flame.

In the old days there were no huts, no Primus stoves, and dogsleds were made from whale bones and reindeer antlers with frozen char rolled up as runners. The only heat and light was



Sharing the Blubber

Hunters prepare to butcher a walrus (opposite), which they harpooned as it came up to breathe at the ice edge. "Not long ago we hunted walruses from kayaks," says Jens, "but they killed too many of us." In camp the dogs are given some of the 800-pound kill, each receiving a portion based on its size and its rank in the pack. One walrus will feed the hunting party for four days.

made from rendered whale and seal blubber. Being out of food meant you were not only hungry but also cold.

We all cram into the 14-by-16-foot hut. Sleeping platforms line the walls. The floor is blood-encrusted from years of walrus and seal hunts. The men tend to the dogs before their own needs. The animals, tied one by one with long chains, howl with delight when they see the buckets of meat.

"Our dogs are like us, they love to eat. They're like running stomachs," Mamarut chimes in, throwing frozen chunks of walrus right into their mouths. Jens holds his big belly in his hands, grinning. He describes his 280-pound bulk as his "Eskimo bank account."

As the storm envelops us, the temperature slides to minus 60°F, but inside the hut, sitting leg to leg, we're snug. Snow covers the sleds; the dogs sleep outside with their noses under their tails. Using a thick steel needle and a thimble made of bearded sealskin, Mamarut repairs his sealskin boots with narwhal sinew thread. Jens plucks the hairs from his face with tweezers. "The hairs sticking out make your face freeze faster," he explains. He fixes a broken harpoon shaft. Our dinner is walrus heart soup, followed by slices of walrus fat to keep us warm. The windows rattle, and the blizzard comes on strong.





A Pack on Edge

Gedion drags his dogs off an ice foot, where the land meets the frozen sea. The dogs sense the ice is melting and resist. "They can smell the salt water and know it's unsafe," says author Gretel Ehrlich. Once on the sea ice, the team will pick its way around the riskiest spots.



The next morning, the hut is quiet except for the hissing sound of the Primus and the howl of the wind. "It's important to be modest in front of the weather," Jens says, rubbing his cold-reddened cheeks. "If we go out in this, frostbite comes quickly, and you don't know it. This cold is like a bad dream, a ghost putting its hands on you."

On days like these, shamans gathered villagers around and conducted séances, rectifying the

“Without knowing the polar bear’s ways, I would have died out here many times.”

wrongs that had been committed and combing the long hair of the goddess Sassuma Arnaa to pacify her so she'd let the animals come to the hunters who needed food and skins. Now, that same kind of quiet intimacy fills our room. Some moments the men are playful—like small boys. Other times they tell hunting stories; not to boast, they say, but to learn from each other's mistakes.

The covenant between human and animals in the wild is always in mind. They hunt and are hunted. They listen and are heard. "Bears, walruses, whales, and seals are always listening to us, and we listen to them. They can understand

what we are saying, and we go inside them each time we wear their skins," Jens explains.

Gedion recalls how a bearded seal almost dragged Jens through the ice. "The line cut down into his hand to the bone, and I sewed it up." An elder took to walking between villages by going over the ice cap instead of along the shore. When he fell into a crevasse, the dogs found him; they had smelled him from miles away and led

the villagers to him, saving the man's life. Searing cold, months of darkness, scarcity and the risk of starvation are the flints on which their imaginations have been fired, triggering

the intuition and intelligence—almost a second sight—still in evidence today. While the outward customs of ceremonial life have vanished, the inward ones remain.

There are long silences. We listen for bears. Tobias, who trained to be an engineer in Denmark then returned to his village to be a hunter again, recalls that this was the hut where he shot his first polar bear. "I did not know if I had killed it, and I stayed inside here all alone all night waiting for the bear to attack me. When nothing happened by morning, I knew he was dead."

Shutters bang in the wind. Everyone laughs.

But when Jens begins talking, there is a reverent silence. In an earlier era, before the Greenlanders' ceremonial life was discouraged by Scandinavian missionaries at the beginning of the 20th century, Jens might have been an *angakkoq*, a shaman.

His voice is low and gravelly: "When I was a boy, my father went out from the village and saw the track of a polar bear. He followed it and finally got very close. His chance to shoot came, but just then the bear turned and looked at him. It had a human face and was smiling at my father and saying, 'Take me. I'm yours!' My father just stood there. He couldn't shoot. He let the bear go. If a

person has special talents, animals will come and ask to be your helper. You are only asked once by a polar bear, but my father denied it, and it ran away. He had his chance to get the powers. After that, I was afraid of having to meet that kind of polar bear.

"But not long ago it happened to me. Six of us were hunting walrus nearby, and we went up onto a hill to see if we could see the ice edge. Suddenly I started to feel as if there was a polar bear nearby. We were quite far from the dogs. I could hear it breathing. There were others with me, and they heard it too. It was very close, so close we thought we wouldn't be able to get away. We ran down the hill to get our guns. I could hear steps behind me. At the bottom the dogs were out of control. I cut the lead dogs loose, and they ran up the hill where we'd been. I followed with my gun, but there were no tracks. It was the polar bear coming for me. I still feel its spirit, mostly when the weather is changing, when a new season is on the way. Don't ask me where this comes from, but it has happened for generations."

"Like now?" I ask cautiously. He only smiles.

After our three days in the hut, the storm ends. Jens peers out the window at a distant city of stranded icebergs, blunt-cut by a mirage—one of the first signs of spring. The temperature jumps from minus 60°F to only minus 10°F. "It's



A Breed Apart

Traditional hunters judge each other in part by the strength and obedience of their Greenland dogs, a breed descended from canines that accompanied immigrants from Siberia some 5,000 years ago. Greenland bans the import of dogs to keep the breed pure. Hunters raise their own packs, donning polar bear skins (opposite) to teach them to chase the bears.

hot," Jens complains, wiping his forehead. The ice is pink in morning light.

We pack the sleds and will make our way toward Walrus El Dorado. We're almost out of meat (a walrus goes fast with so many mouths to feed) and won't have any extra to bring back to Qaanaaq. A blustery wind comes up. "This will break the ice," Gedion says, matter-of-factly. As we make our way down the coast, then out into Baffin Bay, the ice is so broken and rotten we are forced to turn back before it breaks away. A sense of despair settles over the hunters.

"This changing weather is bad for us," Jens says, scowling. "Some people are having to go other ways to make a living." His wife, Ilaituk, who used to accompany him on these hunting trips, has had to take a job at a day-care center in Qaanaaq to help pay their bills, which they both hate.

The hunters get off their sleds and talk. A decision is made: We will turn north again, then travel west to Kiatak Island, where, they say, the ice is always good. But to get there has become almost impossible. The shore ice around the headlands where we traveled the previous week is impassable. We're forced to go up and over a corner of the ice sheet. The way is steep, and a deep crevasse threatens to swallow our sleds. Lobes of



translucent green ice bulge through snow. At the top we take air, flying off a cornice. Down the other side we follow a dry, narrow streambed, leaning from side to side for balance and

using our feet to turn the sled. Despite the ropes laid under the runners, the sleds go too fast: Dogs slalom around boulders. We reach the bottom at midnight and are forced to go up the coast on rotating ice pans. Sometime toward morning, we make camp just inside a fjord.

The hunt for walrus has turned into a hunt for ice. We make our way west over bad ice with mist falling down the mountain cliffs. Between Kiatak and neighboring Qeqertarsuaq Island, there is no ice at all, and we must travel on the remains of an ice foot—a skirt of ice attached to the shore. Where the ice foot ends abruptly, the men belay their dogs and sled off a cliff, continuing to Kiatak on ice pans so rotten they dissolve into a layer of slush beneath the dogs' feet.

During the night, Mamarut's lead dog becomes ill. "Once they are like that they never get well," Gedion observes coolly. The next morning, before hitching up, Mamarut walks back up the hill and shoots his dog. "Now there will be a fight among my other dogs to see who will be the leader," Mamarut says, already thinking ahead.

But is there a future for these subsistence hunters of the far north? Everywhere in the Arctic, indigenous people are suffering. In Alaska the villages on the north coast are being inundated by the rising sea. In some Greenland villages last winter there was no sea ice at all. A few hunters in Qaanaaq and Moriusaq had to shoot some of their dogs because they had no meat for them.

Without sea ice, without sled dogs, without polar bears, marine mammals, and birds, traditional life in the Arctic could crumble quickly. "Once one piece of our life goes, it all goes," Jens says. "It is just like the ice. If it does not hold

"Our dogs are like us, they love to eat. They're like running stomachs."

together, we cannot make any sense of our lives."

On the next to last day of our trip we emerge from our hut on the north side of Kiatak Island. Jens and Mamarut are boyishly cheerful, despite the disappointment of having no meat to bring home. They race each other up a steep snowfield. Because Kiatak lies farther west than any other land in Greenland, they're sure that, looking out over Baffin Bay toward Ellesmere Island, they'll see an ice edge sturdy enough to hold their dog-sleds. This is where the walruses will be.

What they see astonishes them: There's no ice edge, only the glitter of open water all the way to Canada. Jens blinks, looks away to one side, then back out at the sea.

"In my whole life, and that of my father and grandfather, there has never been anything like this at this time of year. Without ice, we can't live. Without ice, we're nothing at all."

WARMING UP What are other effects of climate change? Find out through an online archive of recent GEOGRAPHIC stories. Then experience life as an Arctic hunter in a gallery of photographs with tips by David McLain at ngm.com/0601.

Sled Maintenance

Waiting for the weather to clear, hunters scrape ice off their sled runners to make them faster (below). They also sew rips in clothing, sharpen harpoons, and clean their gear—all while trying to conserve energy. In the hut, Mamarut Kristiansen looks over Jens's shoulder (opposite) as he plays a handheld video game.



A Future for Ice?

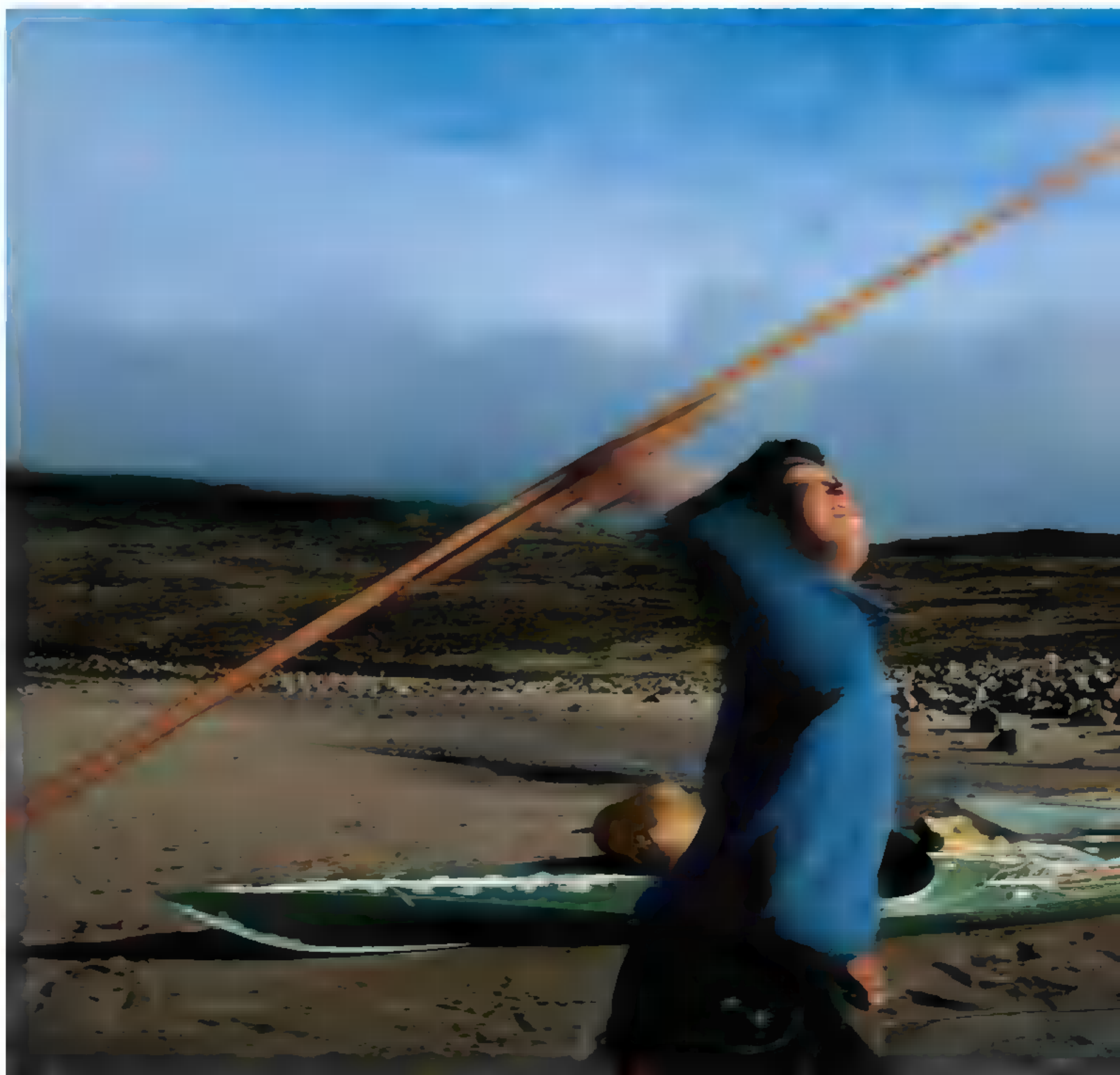
A hut on Kiatak Island offered a prime base to hunt game on frozen Baffin Bay. But in late March it now stands within sight of a broad stretch of open water, a sign the spring melt has come earlier than normal and an important hunting season has been cut short. "When the day comes that we don't get any ice," says a local hunter, "then we will be a disaster."





New season, new hunt

When the sea ice melts, kayaks replace dogsleds, and the Greenlanders' hunt for food continues—now for the elusive narwhal.





Following age-old summer rhythms, both narwhals and the Greenlanders who hunt them find their way to Inglefield Fjord, its placid blue waters temporarily freed from the vise grip of winter ice by 24-hour July sun. Masauna Kristiansen (left) emulates the harpoon skills of hunters like Mamarut Kristiansen, who has speared the season's first kill (above). But hunting narwhal is no child's play. Since the Greenlanders generally don't swim—it's too cold to learn—they face extreme danger battling the tusked whales aboard their low-riding kayaks, which are easily capsized. Hunter Jens Danielsen barely escaped when a narwhal once punctured his kayak. "I had to paddle in fast before I sank."





Where the narwhal spends the long winter remains a mystery.



Once the dead narwhal is towed to shore (left), Gedion cuts off and cleans its spiraled tusk—a long tooth that protrudes from below the nose. A tusk can fetch about 600 dollars, but this one will be a wedding gift for a friend. The real prize is the narwhal meat, which will feed both people and dogs during the summer. The hunters cut the meat into slabs and cover it with large stones to protect it (above). Among the smaller members of the whale family, narwhals grow no longer than 14 feet and live only in the Arctic. They swim up the fjords in July and August to calve and feed, but where they spend the long winter remains ■ mystery. “Last August Danish biologists put a big net across the mouth of the fjord to put radio transmitters on them,” says one hunter. “So far they haven’t caught ■ single one.”



The blood of the narwhal returns to the sea as hunters butcher an animal in shallows along the shore. *"Mattaaq* [fat and skin] is the best thing you can have," says an elderly woman named Patdlunguaq who lives nearby. "White man food isn't good." As for the future, she thinks the hunt will continue. "If you want to live up here, you have to be a hunter," she says. "But I know humans are changing the world. I heard they're even changing the weather." □





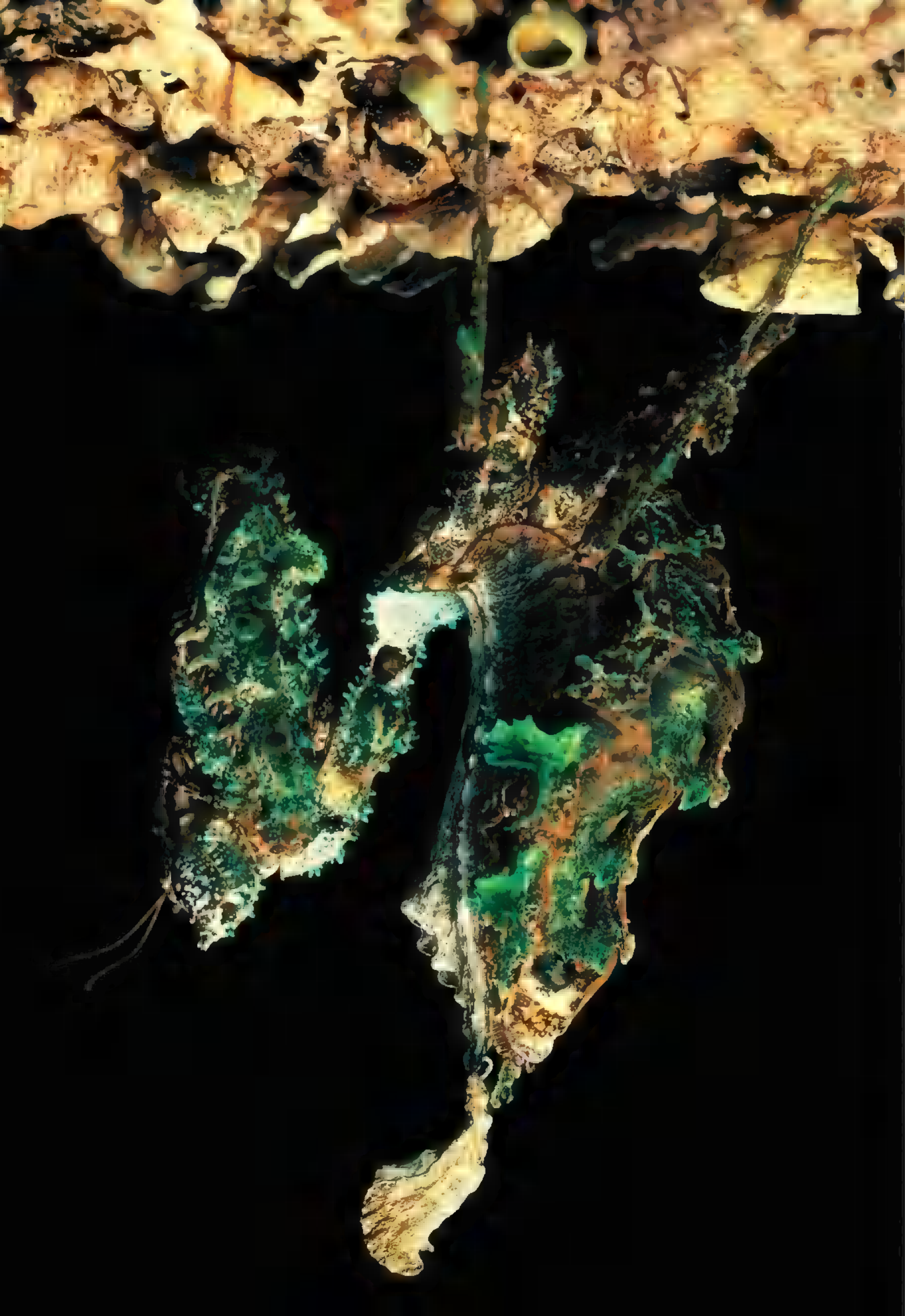
mantids

armed and dangerous

text and photographs by mark w. moffett

She seems almost human, this mantid I found in West Africa. She has such alert eyes, and her head tilts to follow me. But she is pure menace to any prey that happens to wander within range of those huge forelegs, which can snap shut like bear traps. Most of the roughly 1,800 species of mantids—often called praying mantises—spend their time sitting and waiting, seemingly at prayer. In fact, I learned as I pursued them across four continents, they are among the insect world's craftiest hunters.

SPHODROMANTIS LINEOLA, 3.5 ■





brilliant disguise

Camouflage is ■ mantid art form, helping them hunt prey and hide from predators. An Ecuadorian mantid (left) matches the color and texture of lichen on the twig from which it hangs; its arms are folded under its head, at left, but its antennae are ■ giveaway. A juvenile Burmese flower mantid (above) blends in with ■ plant's stamens in Myanmar. Mantids can also mimic leaves, grass, twigs, stones, even ants.

PSEUDACANTHOPS SP., 2.5 IN (LEFT); *CREOBROTER SP.* NYMPH, 1.5 IN



stepping out

Just weeks old, a juvenile flower mantid tiptoes through a Myanmar rain forest, perhaps searching for a spot to ambush insects.

Mantid females lay a foamy mass of tens to hundreds of eggs, which hatch after a few weeks. The wingless nymphs that emerge often fall victim to spiders and other predators. Those that survive grow into adults, usually winged, that range from an inch long in a California species to seven inches in an African giant.

PHOTOGRAPHS BY JOHN T. COOPER



swift and precise, a mantid can dismember an animal larger than itself.



predator and prey

In Gabon ■ mantid becomes a lizard's lunch (above). But another mantid, also from Gabon, turns the tables by dining on a different lizard, a gecko (left). Mantid fare includes insects, frogs, birds, turtles, and, famously, each other. Females may devour males during mating. Sexual cannibalism has received a lot of attention but may not be common in the wild. It has almost always been observed in captivity, where males cannot escape.

PLISTOSPILOTA SP., 4 IN (LEFT); MIOMANTIS SP., 3 ■

A dead-leaf mantid (Zethenia truncata) is camouflaged among brown, withered leaves. The mantid's body is a mottled brown and tan, perfectly matching the color and texture of the surrounding foliage. Its long, segmented legs are also camouflaged, making it nearly invisible. The mantid is positioned in the lower-left quadrant of the frame, facing right. The background is a dense thicket of similar leaves, creating a complex pattern of light and shadow that enhances the mantid's camouflage.

leaf look-alike

This Malaysian mantid aims to fool enemies and prey alike. Called a dead-leaf mantid, its body perfectly imitates withered foliage, though its head is recognizable. Mantids have plenty of reasons to hide. Birds, snakes, spiders, toads, and rodents all feast on mantids lurking in foliage and on the forest floor. At night, bats snap up flying mantids.





masters of adaptation, mantids need little more than a supply of prey and a spell of warm weather.

FIND OUT what mantids and martial arts have in common, learn about mantid lore, and visit an online photo gallery at ngm.com/0601.



at home, rain or shine

A moss-patterned mantid scurries over the rain forest floor in Suriname (left). Half a world away, a mantid watches an Arizona sunset from a creosote bush in the Sonoran Desert (above). Both are juveniles, with developing wing buds. Mantids are found in many habitats and on every continent except Antarctica. They have fascinated humans for thousands of years, including the ancient Greeks, who were the first to use the term mantis, meaning “prophet.” □

LITURGUSA SP. NYMPH, 2 IN (LEFT); STAGMOMANTIS LIMBATA NYMPH, 2 IN



36460 To Catch a Mockingbird

Everyone in Monroeville, Alabama, turns out to attend the annual stage version of *To Kill a Mockingbird*, the famous novel by the town's part-time resident, Harper Lee. Everyone, that is, except the author herself.





■ *Mockingbird's* fictional town of Maycomb, a few rowdy citizens set the tone for a drama about the irrationality and evil

BY CATHY NEWMAN
NATIONAL GEOGRAPHIC SENIOR WRITER

**PHOTOGRAPHS BY
MICHAEL NICHOLS**
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“Top secret,” Mr. X whispered to me toward the end of my stay in Monroeville, Alabama. “Nelle is in town.”

By then, though, I was in on the secret. Three other people had also mentioned Nelle sightings that day. Besides, I’d spotted the secret myself—having driven by a bank building and seen a thick-bodied woman with short, white hair dressed in slacks and a short-sleeve shirt help an older, wren-like woman out of the car and on to a walker. It was Harper Lee (whose first name is Nelle), author of *To Kill a Mockingbird*, dropping off her older sister, Alice Finch Lee, at the office where she practices law.

Monroeville, where Harper Lee grew up and where Truman Capote, her childhood friend, spent summers, is the self-proclaimed literary



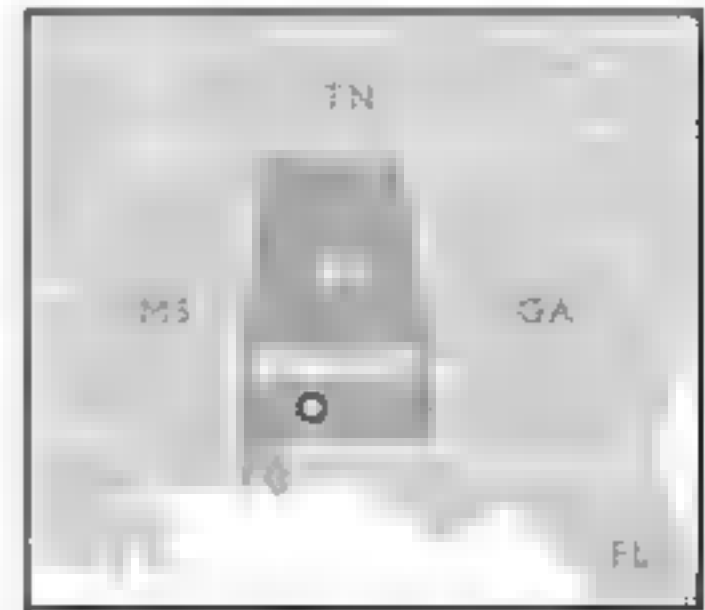
of prejudice in the segregated South of 1935.

capital of Alabama. The label is not met with approbation by everyone. "All anyone wants to talk about is Nelle and Truman," said Jennings Carter, a retired crop duster pilot and first cousin to Capote. "There's more here than that."

OK, Mr. Carter, shoot.

"I don't mean to sound like the Chamber of Commerce, but we have a good strip of farmland, cattle, and timber."

For sure, there's a lot of timber. To be on a thin, dusty road caught behind a log-laden truck is to resign yourself to flipping the dial to one of the ever present airwave evangelists, for you will be behind that truck till kingdom come. Monroeville, tucked away 30 miles off exit 93 of I-65



POPULATION: 7,000
NUMBER OF PEOPLE WHO ATTEND THE PLAY EACH YEAR: 5,000
NUMBER OF PERFORMANCES IN 2005: 16
LAWYERS IN CAST: 3
PREACHERS IN CAST: 2
COPIES OF BOOK SOLD: 30 MILLION
DISSERTATIONS BASED ON BOOK: 16
OSCARS WON BY FILM VERSION: 3





Barbara Knight) tell Atticus that one of their members, Tom Robinson, has been unjustly accused of raping a white woman.

A man in a hospital gown is shown from the chest up, looking out a window. The scene is dimly lit, with light coming from the window behind him. Two speech bubbles are overlaid on the image, one above and one below the man's head.

Take my medicine every day?
HIGH BLOOD PRESSURE
can't be that serious.

Yes it is serious. You need to
take your **TOPROL-XL** every day.
No ifs, ands, or buts...

high blood pressure matters more than you know.

It's always with you, even on those days you seem to feel okay. And high blood pressure can make your heart work harder than it should. That's why it's such a big deal—just ask your doctor.

You need to exercise, eat healthy, and take your TOPROL-XL—not just most days, but every day.

As long as you keep taking it, TOPROL-XL works to help you manage your blood pressure—throughout the day. And yes, that means every day.

Important information you should know about TOPROL-XL (by prescription only)

TOPROL-XL is used to treat high blood pressure. It's good to know the medicine you're taking, so talk to your doctor about high blood pressure and TOPROL-XL.

TOPROL-XL is not right for everyone, especially people who have the following health conditions.

- Extreme slowing of the heart rate (severe bradycardia)
- Sudden and severe drop in the blood pressure and blood flow through the body because the heart is not pumping normally (cardiogenic shock)
- Uncontrolled heart failure
- Slowdown of the heart's electrical signal causing a slower heart rate (specifically, second- or third-degree heart block)
- Damage to the heart's natural pacemaker that affects the heart's rhythm (unless a pacemaker device is in the body) (sick sinus syndrome)
- Any allergies to TOPROL-XL or its ingredients

Please see adjacent page for a brief summary of full Prescribing Information.

It is important to take your medications every day as directed by your doctor.

Patients should not stop taking TOPROL-XL suddenly because of the possibility of serious side effects, such as chest pain or a heart attack. If your doctor decides you should stop taking TOPROL-XL, your doctor or health care provider may instruct you to slowly reduce your dose over a period of time before stopping it completely.

In some patients, TOPROL-XL should be used with caution: Those with asthma or asthma-like lung disease; taking certain calcium channel blockers; have diabetes; overactive thyroid disease; hardening or constriction of the arteries in the arms or legs; or those planning to have surgery.

Until you know how you will react to TOPROL-XL, avoid activities that require alertness.

The most common side effects reported by patients in clinical trials were tiredness, dizziness, depression, diarrhea, itching or rash, shortness of breath, and slow heart rate. If you experience any of these or other side effects, contact your doctor.

Need answers? Contact AstraZeneca

Visit TOPROL-XL.com/ad or call 877-564-6442

- Find more information on TOPROL-XL
- Join Heart Horizons, a free support program with helpful tips, special offers, and information for people who take TOPROL-XL
- Learn how we may be able to help if you do not have prescription coverage and cannot afford your medicines

TAKE IT. SERIOUSLY.



TOPROL-XL[®]
(metoprolol succinate)
extended-release tablets

AstraZeneca



Please read this summary carefully and then ask your doctor about TOPROL-XL. Do not stop treatment without first talking with your doctor.
No advertisement can provide all the information needed to determine if a drug is right for you. This advertisement does not take the place of careful discussions with your doctor.
Only your doctor has the training to weigh the risks and benefits of a prescription drug.



BRIEF SUMMARY: For full Prescribing Information, see package insert.

INDICATIONS AND USAGE

Hypertension: TOPROL-XL is indicated for the treatment of hypertension. It may be used alone or in combination with other antihypertensive agents. **Angina Pectoris:** TOPROL-XL is indicated in the long-term treatment of angina pectoris. **Heart Failure:** TOPROL-XL is indicated for the treatment of stable, symptomatic (NYHA Class II or III) heart failure of ischemic, hypertensive, or cardiomyopathic origin. It was studied in patients already receiving ACE inhibitors, diuretics, and, in the majority of cases, digitalis. In this population, TOPROL-XL decreased the rate of mortality plus hospitalization, largely through a reduction in cardiovascular mortality and hospitalizations for heart failure.

CONTRAINDICATIONS

TOPROL-XL is contraindicated in severe bradycardia, heart block greater than first degree, cardiogenic shock, decompensated cardiac failure, sick sinus syndrome (unless a permanent pacemaker is in place) (see WARNINGS) and in patients who are hypersensitive to any component of this product.

WARNINGS

Ischemic Heart Disease: Following abrupt cessation of therapy with certain beta-blocking agents, exacerbations of angina pectoris and, in some cases, myocardial infarction have occurred. When discontinuing chronically administered TOPROL-XL, particularly in patients with ischemic heart disease, the dosage should be gradually reduced over a period of 1-2 weeks and the patient should be carefully monitored. If angina markedly worsens or acute coronary insufficiency develops, TOPROL-XL administration should be reinstated promptly, at least temporarily, and other measures appropriate for the management of unstable angina should be taken. Patients should be warned against interruption or discontinuation of therapy without the physician's advice. Because coronary artery disease is common and may be unrecognized, it may be prudent not to discontinue TOPROL-XL therapy abruptly even in patients treated only for hypertension.

Bronchospastic Diseases: PATIENTS WITH BRONCHOSPASTIC DISEASES SHOULD, IN GENERAL, NOT RECEIVE BETA-BLOCKERS. Because of its relative beta₁-selectivity, however, TOPROL-XL may be used with caution in patients with bronchospastic disease who do not respond to, or cannot tolerate, other antihypertensive treatment. Since beta₁-selectivity is not absolute, a beta₂-stimulating agent should be administered concomitantly, and the lowest possible dose of TOPROL-XL should be used (see DOSAGE AND ADMINISTRATION). **Major Surgery:** The necessity or desirability of withdrawing beta-blocking therapy prior to major surgery is controversial; the impaired ability of the heart to respond to reflex adrenergic stimuli may augment the risks of general anesthesia and surgical procedures. TOPROL-XL like other beta-blockers, is a competitive inhibitor of beta-receptor agonists, and its effects can be reversed by administration of such agents, eg, dobutamine or isoproterenol. However, such patients may be subject to protracted severe hypotension. Difficulty in restarting and maintaining the heart beat has also been reported with beta-blockers. **Diabetes and Hypoglycemia:** TOPROL-XL should be used with caution in diabetic patients if a beta-blocking agent is required. Beta-blockers may mask tachycardia occurring with hypoglycemia, but other manifestations such as dizziness and sweating may not be significantly affected. **Thyrotoxicosis:** Beta-adrenergic blockade may mask certain clinical signs (eg, tachycardia) of hyperthyroidism. Patients suspected of developing thyrotoxicosis should be managed carefully to avoid abrupt withdrawal of beta-blockade, which might precipitate a thyroid storm. **Peripheral Vascular Disease:** Beta-blockers can precipitate or aggravate symptoms of arterial insufficiency in patients with peripheral vascular disease. Caution should be exercised in such individuals. **Calcium Channel Blockers:** Because of significant inotropic and chronotropic effects in patients treated with beta-blockers and calcium channel blockers of the verapamil and diltiazem type, caution should be exercised in patients treated with these agents concomitantly.

PRECAUTIONS

General: TOPROL-XL should be used with caution in patients with impaired hepatic function, in patients with pheochromocytoma, an alpha-blocking agent should be initiated prior to the use of any beta-blocking agent. Worsening cardiac failure may occur during up-titration of TOPROL-XL. If such symptoms occur, diuretics should be increased and the dose of TOPROL-XL should not be advanced until clinical stability is restored (see DOSAGE AND ADMINISTRATION). It may be necessary to lower the dose of TOPROL-XL or temporarily discontinue it. Such episodes do not preclude subsequent successful titration of TOPROL-XL. **Information for Patients:** Patients should be advised to take TOPROL-XL regularly and continuously, as directed, preferably with or immediately following meals. If a dose should be missed, the patient should take only the next scheduled dose (without doubling it). Patients should not interrupt or discontinue TOPROL-XL without consulting the physician. Patients should be advised (1) to avoid operating automobiles and machinery or engaging in other tasks requiring alertness until the patient's response to therapy with TOPROL-XL has been determined; (2) to contact the physician if any difficulty in breathing occurs; (3) to inform the physician or dentist before any type of surgery that he or she is taking TOPROL-XL. Heart failure patients should be advised to consult their physician if they experience signs or symptoms of worsening heart failure such as weight gain or increasing shortness of breath. **Laboratory Tests:** Clinical laboratory findings may include elevated levels of serum transaminase, alkaline phosphatase, and lactate dehydrogenase. **Drug Interactions:** Catecholamine-depleting drugs (eg, reserpine, monoamine oxidase (MAO) inhibitors) may have an additive effect when given with beta-blocking agents. Patients treated with TOPROL-XL plus a catecholamine depletor should therefore be closely observed for evidence of hypotension or marked bradycardia, which may produce vertigo, syncope, or postural hypotension. Drugs that inhibit CYP2D6 such as quinidine, fluoxetine, paroxetine, and propafenone are likely to increase metoprolol concentration. In healthy subjects with CYP2D6 extensive metabo-

lizer phenotype, coadministration of quinidine 100 mg and immediate release metoprolol 200 mg tripled the concentration of S-metoprolol and doubled the metoprolol elimination half-life. In four patients with cardiovascular disease, coadministration of propafenone 150 mg t.i.d. with immediate release metoprolol 50 mg t.i.d. resulted in two- to five-fold increases in the steady-state concentration of metoprolol. These increases in plasma concentration would decrease the cardioselectivity of metoprolol. Beta-blockers may exacerbate the rebound hypertension which can follow the withdrawal of clonidine. If the two drugs are coadministered, the beta blocker should be withdrawn several days before the gradual withdrawal of clonidine. If replacing clonidine by beta-blocker therapy, the introduction of beta-blockers should be delayed for several days after clonidine administration has stopped. **Carcinogenesis, Mutagenesis, Impairment of Fertility:** Long-term studies in animals have been conducted to evaluate the carcinogenic potential of metoprolol tartrate. In 2-year studies in rats at three oral dosage levels of up to 800 mg/kg/day (41 times, on a mg/m² basis, the daily dose of 200 mg for a 60-kg patient), there was no increase in the development of spontaneously occurring benign or malignant neoplasms of any type. The only histologic changes that appeared to be drug related were an increased incidence of generally mild focal accumulation of foamy macrophages in pulmonary alveoli and a slight increase in biliary hyperplasia. In a 21-month study in Swiss albino mice at three oral dosage levels of up to 750 mg/kg/day (18 times, on a mg/m² basis, the daily dose of 200 mg for a 60-kg patient), benign lung tumors (small adenomas) occurred more frequently in female mice receiving the highest dose than in untreated control animals. There was no increase in malignant or total (benign plus malignant) lung tumors, nor in the overall incidence of tumors in malignant tumors. This 21-month study was repeated in CD-1 mice, and statistically or biologically significant differences were observed between treated and control mice of either sex for any type of tumor. Genotoxicity tests performed on metoprolol tartrate (a dominant lethal study in mice, chromosome studies in somatic cells, a *Salmonella/mammalian-microsome* mutagenicity test, and a nucleus anomaly test in somatic interphase nuclei) and metoprolol succinate (a *Salmonella/mammalian-microsome* mutagenicity test) were negative. Evidence of impaired fertility due to metoprolol tartrate was observed in a study performed in rats at doses up to 22 times, on a mg/m² basis, the daily dose of 200 mg in a 60-kg patient. **Pregnancy Category C:** Metoprolol tartrate has been shown to increase post-implantation loss and decrease neonatal survival in rats at doses up to 22 times, on a mg/m² basis, the daily dose of 200 mg in a 60-kg patient. Distribution studies in mice confirm exposure of the fetus when metoprolol tartrate is administered to the pregnant animal. These studies have revealed no evidence of impaired fertility or teratogenicity. There are adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, this drug should be used during pregnancy only if clearly needed. **Nursing Mothers:** Metoprolol is excreted in breast milk in very small quantities. An infant consuming 1 liter of breast milk daily would receive a dose of less than 1 mg of the drug. Caution should be exercised when TOPROL-XL is administered to a nursing woman. **Pediatric Use:** Safety and effectiveness in pediatric patients have not been established. **Geriatric Use:** Clinical studies of TOPROL-XL in hypertension did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. Other reported clinical experience in hypertensive patients has not identified differences in responses between elderly and younger patients. Of the 1,990 patients with heart failure randomized to TOPROL-XL in the MERIT-HF trial, 50% (990) were 65 years of age and older and 12% (238) were 75 years of age and older. There were no notable differences in efficacy or the rate of adverse events between older and younger patients. In general, dose selection for an elderly patient should be cautious, usually starting at the low end of the dosing range, reflecting greater frequency of decreased hepatic, renal, or cardiac function, and of concomitant disease or other drug therapy. **Risk of Anaphylactic Reactions:** While taking beta-blockers, patients with a history of severe anaphylactic reactions to a variety of allergens may be more reactive to repeated challenge, either accidental, diagnostic, or therapeutic. Such patients may be unresponsive to the usual doses of epinephrine used to treat allergic reaction.

ADVERSE REACTIONS

Hypertension and Angina: Most adverse effects have been mild and transient. The following adverse reactions have been reported for immediate release metoprolol tartrate. **Central Nervous System:** Tiredness and dizziness have occurred in about 10 of 100 patients. Depression has been reported in about 5 of 100 patients. Mental confusion and short-term memory loss have been reported. Headache, somnolence, nightmares, and insomnia have also been reported. **Cardiovascular:** Shortness of breath and bradycardia have occurred in approximately 3 of 100 patients. Cold extremities; arterial insufficiency, usually of the Raynaud type; palpitations; congestive heart failure; peripheral edema; syncope; chest pain; and hypotension have been reported in about 1 of 100 patients (see CONTRAINDICATIONS, WARNINGS and PRECAUTIONS). **Respiratory:** Wheezing (bronchospasm) and dyspnea have been reported in about 1 of 100 patients (see WARNINGS). **Gastrointestinal:** Diarrhea has occurred in about 5 of 100 patients. Nausea, dry mouth, gastric pain, constipation, flatulence, digestive tract disorders, and heartburn have been reported in about 1 of 100 patients. **Hypersensitive Reactions:** Pruritus or rash have occurred in about 5 of 100 patients. Worsening of psoriasis has also been reported. **Miscellaneous:** Peyronie's disease has been reported in fewer than 1 of 100,000 patients. Musculoskeletal pain, blurred vision, decreased libido and tinnitus have also been reported. There have been rare reports of reversible alopecia, agranulocytosis, and dry eyes. Discontinuation of the drug should be considered if any such reaction is not otherwise explicable. The oculomucocutaneous syndrome associated with the beta-blocker practolol has not been reported with metoprolol. **Potential Adverse Reactions:** In addition, there are a variety of adverse reactions not listed above, which have been reported with other beta-adrenergic blocking agents and should be considered potential adverse reactions to TOPROL-XL. **Central Nervous System:** Reversible mental depression progressing to catatonia; an acute reversible syndrome characterized by disorientation for time and place, short-term memory loss, emotional lability, slightly clouded sensorium, and decreased performance on neuropsychometrics. **Cardiovascular:** Intensification of AV block (see CONTRAINDICATIONS). **Hematologic:** Agranulocytosis, nonthrombocytopenic purpura, thrombocytopenic purpura. **Hypersensitive Reactions:** Fever combined with aching and sore throat, laryngospasm, and respiratory distress. **Heart Failure:** In the MERIT-HF study, serious adverse events and adverse events leading to discontinuation of study medication were systematically collected. In the MERIT-HF study comparing TOPROL-XL in daily doses up to 200 mg (mean dose 159 mg once-daily) (n=1990) to placebo (n=2001), 10.3% of TOPROL-XL patients discontinued for adverse events vs. 12.2% of placebo patients. The table below lists adverse events in the MERIT-HF study that occurred at an incidence of equal to or greater than 1% in the TOPROL-XL group and greater than placebo by more than 0.5%, regardless of the assessment of causality.

Adverse Events Occurring in the MERIT-HF Study at an Incidence ≥1% in the TOPROL-XL Group and Greater Than Placebo by More Than 0.5%

	TOPROL-XL N=1990 % of patients	Placebo N=2001 % of patients
Dizziness/vertigo	1.8	1.0
Bradycardia	1.5	0.4
Accident and/or injury	1.4	■

Other adverse events with an incidence of >1% on TOPROL-XL and as common as placebo (within 0.5%) included myocardial infarction, pneumonia, cerebrovascular disorder, chest pain, dyspnea/dyspnea aggravated, syncope, coronary artery disorder, ventricular tachycardia/arrhythmia aggravated, hypotension, diabetes mellitus/diabetes mellitus aggravated, abdominal pain, and fatigue. **Post-Marketing Experience:** The following adverse reactions have been reported with TOPROL-XL in worldwide post-marketing use, regardless of causality: **Cardiovascular:** 2nd and 3rd degree heart block; **Gastrointestinal:** hepatitis, vomiting; **Hematologic:** thrombocytopenia; **Musculoskeletal:** arthralgia; **Nervous System/Psychiatric:** anxiety/nervousness, hallucinations, paresthesia; **Reproductive, male:** impotence; **Skin:** increased sweating, photosensitivity, urticaria; **Special Sense Organs:** taste disturbances.

OVERDOSAGE

Acute Toxicity: There have been a few reports of overdosage with TOPROL-XL and no specific overdosage information was obtained with this drug, with the exception of animal toxicology data. However, since TOPROL-XL (metoprolol succinate salt) contains the same active moiety, metoprolol, as conventional metoprolol tablets (metoprolol tartrate salt), the recommendations for overdosage for metoprolol conventional tablets are applicable to TOPROL-XL. **Signs and Symptoms:** Overdosage of TOPROL-XL may lead to severe hypotension, sinus bradycardia, atrioventricular block, heart failure, cardiogenic shock, cardiac arrest, bronchospasm, impairment of consciousness/coma, nausea, vomiting, and cyanosis. **Treatment:** In general, patients with acute recent myocardial infarction or congestive heart failure may be more hemodynamically unstable than other patients and should be treated accordingly. When possible the patient should be treated under intensive care conditions. On the basis of the pharmacologic actions of metoprolol, the following general measures should be employed: **Elimination of the Drug:** Gastric lavage should be performed. **Bradycardia:** Atropine should be administered. If there is no response to vagal blockade, isoproterenol should be administered cautiously. **Hypotension:** A vasopressor should be administered, eg, levarterenol or dopamine. **Bronchospasm:** A beta₂-stimulating agent and/or a theophylline derivative should be administered. **Cardiac Failure:** A digitalis glycoside and diuretics should be administered. In shock resulting from inadequate cardiac contractility, administration of dobutamine, isoproterenol, or glucagon may be considered.

DOSAGE AND ADMINISTRATION

TOPROL-XL is an extended release tablet intended for once daily administration. For treatment of hypertension and angina, when switching from immediate release metoprolol to TOPROL-XL, the same total daily dose of TOPROL-XL should be used. Dosages of TOPROL-XL should be individualized and titration may be needed in some patients. TOPROL-XL tablets are scored and can be divided; however, the whole or half tablet should be swallowed whole and not chewed or crushed. **Hypertension:** The usual initial dosage is 25 to 100 mg daily in a single dose, whether used alone or added to a diuretic. The dosage may be increased at weekly (or longer) intervals until optimum blood pressure reduction is achieved. In general, the maximum effect of any given dosage level will be apparent after 1 week of therapy. Dosages above 400 mg per day have not been studied. **Angina Pectoris:** The dosage of TOPROL-XL should be individualized. The usual initial dosage is 100 mg daily, given in a single dose. The dosage may be gradually increased weekly intervals until optimum clinical response has been obtained or there is a pronounced slowing of the heart rate. Dosages above 400 mg per day have not been studied. If treatment is to be discontinued, the dosage should be reduced gradually over a period of 1-2 weeks (see WARNINGS). **Heart Failure:** Dosage must be individualized and closely monitored during up-titration. Prior to initiation of TOPROL-XL, the dosing of diuretics, ACE inhibitors, and digitalis (if used) should be stabilized. The recommended starting dose of TOPROL-XL is 50 mg once daily for two weeks in patients with NYHA class II heart failure and 12.5 mg once daily in patients with more severe heart failure. The dose should then be doubled every two weeks to the highest dosage level tolerated by the patient or up to 200 mg of TOPROL-XL. If transient worsening of heart failure occurs, it may be treated with increased doses of diuretics, and it may also be necessary to lower the dose of TOPROL-XL or temporarily discontinue it. The dose of TOPROL-XL should not be increased until symptoms of worsening heart failure have been stabilized. Initial difficulty with titration should not preclude later attempts to introduce TOPROL-XL. If heart failure patients experience symptomatic bradycardia, the dose of TOPROL-XL should be reduced.

HOW SUPPLIED

Tablets containing metoprolol succinate equivalent to the indicated weight of metoprolol tartrate, USP, are white, biconvex, film-coated, and scored.

Tablet	Shape	Engraving	Bottle of 100 NDC 0186-	Unit Dose Packages of 100 NDC 0186-
25 mg*	Oval	A 6	1088-05	1088-39
50 mg	Round	A mo	1090-05	1090-39
100 mg	Round	A ms	1092-05	1092-39
200 mg	Oval	A my	1094-05	N/A

*The 25-mg tablet is scored on both sides.

Store at 25°C (77°F). Excursions permitted to 15-30°C (59-86°F). (See USP Controlled Room Temperature.)

NOTE: This summary provides important information about TOPROL-XL. For more information, please ask your doctor or health care professional about the full Prescribing Information and discuss it with them.

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Manufactured for: AstraZeneca LP, Wilmington, DE 19850

By: AstraZeneca AB, S-151 85 Södertälje, Sweden

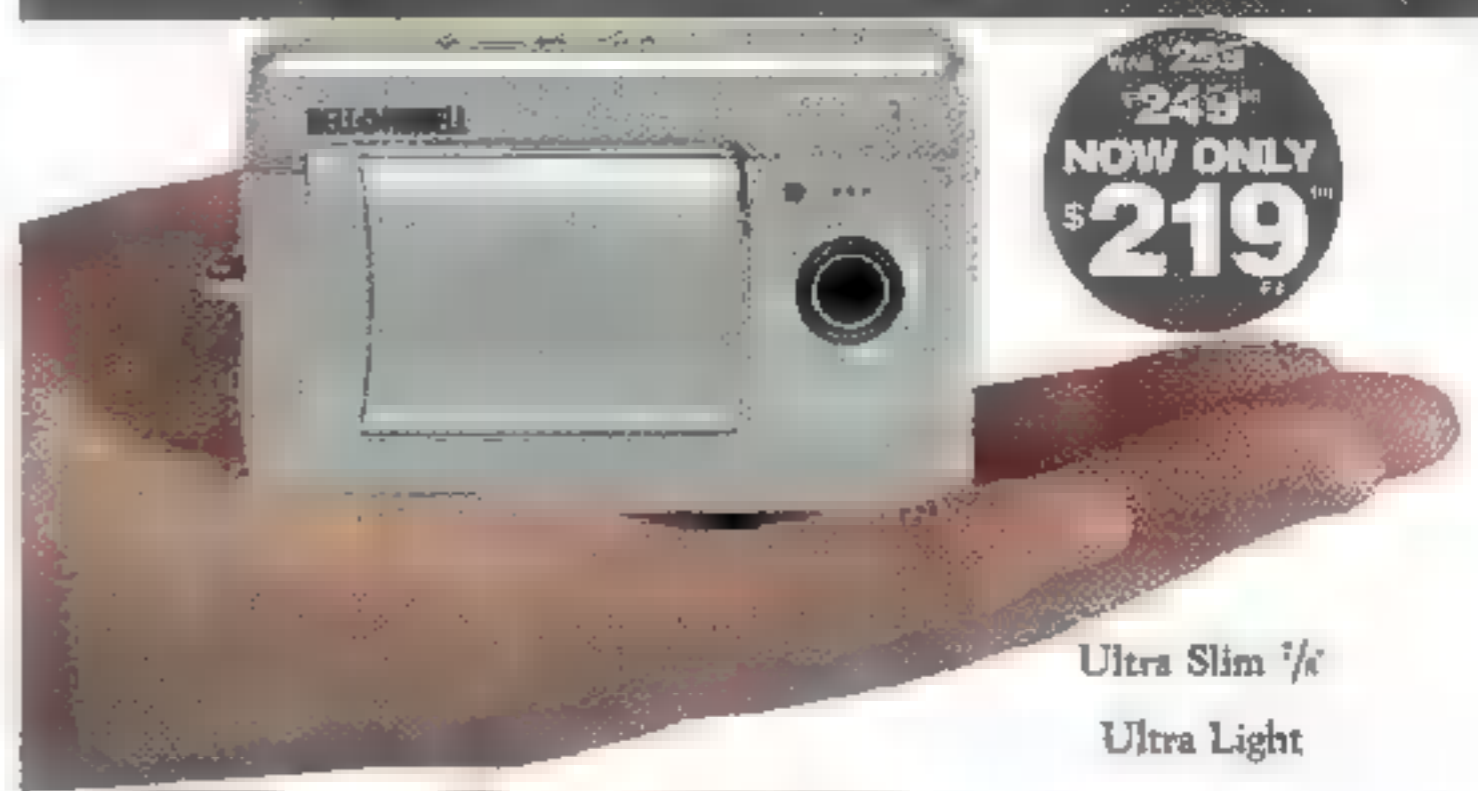
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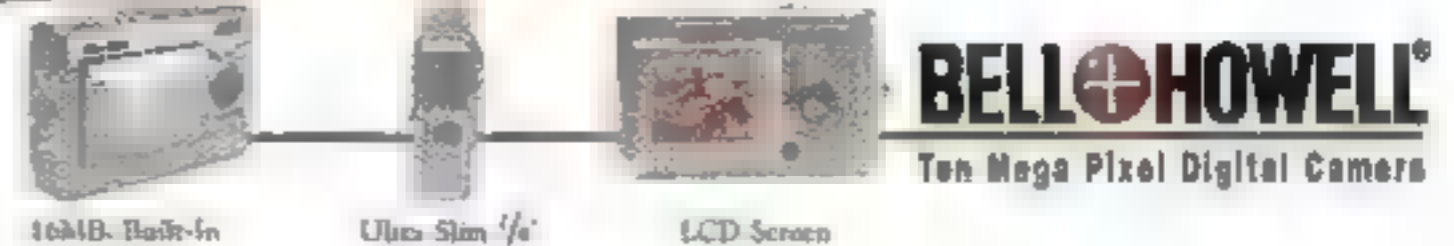


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Never run out of batteries

Many digital cameras require expensive, hard to find batteries. This camera works on ordinary alkaline AAA batteries, rechargeable AAA batteries or AAA lithium ion batteries. So it's easy to keep extra batteries on hand and easy to find replacements if you should run out.

Almost as small as a credit card with big built in memory

This camera is so small it can fit in your shirt pocket. Yet it has an amazing 16 MB of built-in flash memory to store up to 160 photographs depending on resolution. Preserve nearly a lifetime of photographs by using the camera's SD card slot for removable memory cards.

Doubles as a camcorder

Capture those once-in-a-lifetime events in movie mode: baby's first steps, accepting a diploma, catching the wedding bouquet. You get 25 seconds of streaming video with built in flash memory and over 3 minutes on a 128 MB memory card (not included).

\$75-worth of FREE software & cables

Your purchase includes a TV cable and a USB cable for your PC or Mac as well as software to catalog and browse photos, add special effects, or create a slideshow with music. Our digital camera and software allow you to display your pictures on your computer, TV screen, the camera's own LCD screen, or print them almost anywhere.

Loaded With Features:

- 10.0 mega pixels
- Uses interpolation to achieve 10.0 mega pixels
- Up to 160 pictures in built-in 16MB memory
- Ultra small & slim (3 1/4" x 2 1/4" x 1 1/4")
- Up to 8X digital zoom on select settings
- Crystal clear 1.5" color LCD screen
- Sliding cover protects lens
- Includes 2 "AAA" batteries and works on AAA lithium batteries as well
- Built-in flash
- Self timer & continuous shots
- Still/video mode
- 20-second voice memo
- Doubles as camcorder
- Built-in microphone & speaker
- USB cable & TV cable
- Supported OS: Microsoft Windows 98SE, ME, 2000, XP, Mac OS 9.1, 10.1
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MONROEVILLE, ALABAMA

in southwest Alabama, is Bible Belt country through and through. There are 7,000 people and 28 churches; heads bow in grace before meals, and the defining question is, "What church do you belong to?"

But timber, cotton, and churches do not draw 30,000 visitors a year. Harper Lee and *To Kill a Mockingbird* do. The novel won the Pulitzer Prize in 1961, then became an Academy Award-winning movie with Gregory Peck as Atticus Finch, the lawyer who defends a black man accused of raping a white woman in a town, not unlike, well, Monroeville.

High season for Monroeville is May, when the Monroe County Heritage Museums puts on a stage version of *Mockingbird*. The event is a morality play of sorts, a migration of pilgrims paying homage to the powerful sermon of the story. "People around here actually quote lines from the book like scripture," one man told me.

The homegrown cast stars, among others, a forester, the owner of an air-conditioning company, a firefighter, several teachers, and a few lawyers thrown in for good measure. "We always have a pastor play a role," said Carol Champion, who sells souvenirs between acts. "The one year we didn't was the year we got rained out."

Carol's husband, police detective Robert Champion, plays Boo Radley, the neighbor whose reclusiveness captivates Scout and Jem, Atticus's children. "Boo only has one line, so it's all played in body language," he told me. Tall, rangy Dennis Owens, who sells insurance, plays Atticus. "There is no way you can live up to the character of Atticus," he said, "but I like to think you have a few moments in time when you do."

Charles McCorvey, a county commissioner, plays Tom Robinson, the

"Mockingbird was an old town, but it was a town old town... There was no hurry for there was nowhere to go."

—A City Revisited



Atticus (Dennis Owens) questions Mayella Ewell (Robin Scott), the woman who accuses Tom Robinson of rape.



falsely accused black man. “It’s 1935 and survival means ‘yassuh this and that,’ and being mindful and second-class,” says McCorvey. “I had a difficult time with the role until I could leave who I really am and realize I am not in the 21st century.”

The cast volunteers their time. “We’re not putting on a play,” says director Kathy McCoy, “we’re sending a message of racial tolerance.” The show has traveled to Washington, D.C., Hull, England, and Jerusalem, where the jury, drawn from an Israeli audience, balked at finding Tom Robinson guilty. “We wondered what was taking them so long,” said McCorvey. “It turned out they wanted to acquit. They were arguing with the actor who plays the sheriff, who explained that they *had* to convict.”

Though the actor playing the prosecuting attorney once went blank, asked to approach the bench, and was fed his line by the judge, the cast performs like pros. You get the feeling if Broadway called, more than a few would be on their way in a New York minute. They step into character and, sometimes, linger. “I’ve signed checks ‘Boo Radley’ and had them clear,” Champion said.

The actors appear before sold-out audiences, but the one person in town who has never seen the play is Harper Lee. She abhors anything that trades on the book’s fame. As reported in the *Chicago Tribune* by Marja Mills, when the Monroe County Heritage Museums began selling *Calpurnia’s Cookbook*, a compilation of recipes from the cast (“before killing a chicken, be sure to put in coop or small pen and feed well for at least one week,” one entry instructs), Lee demanded it be yanked. (Calpurnia is the Finches’ housekeeper.) The museum dutifully complied.

Gentle Reader, you will not be hearing from Harper Lee here. She no longer gives interviews. (“Hell no” was a response to one inquirer.) She lives most of the year in New York and travels by train to stay with her sister in Monroeville. Though Lee once told a journalist, “all I want to be is the Jane Austen of south Alabama,” she never published another novel. After the flurry of publicity following *Mockingbird*, she retreated into silence.

“She just wants to be left alone. She is not reclusive—she goes out with

In the play’s second act, Calpurnia (Dott Bradley, foreground), the Finches’ housekeeper, and other members of the black community who have been relegated to watching the trial from the balcony, grieve after the jury pronounces Tom Robinson guilty. As Atticus prepares to leave the courtroom, they all rise to acknowledge his courage. Scout has been watching from the balcony too. “Miss Jean Louise, stand up,” the Reverend Sykes instructs her. “Your father’s passin’!”

MONROEVILLE, ALABAMA

friends,” Ms. Y told me. I call her Ms. Y because, like Mr. X, she is fearful of being quoted talking about Harper Lee. Mention Lee, and the wagons circle. “Those who value her companionship walk on eggs,” said George T. Jones, a columnist for the *Monroe Journal*. Perhaps the uneasiness was always there. When the novel first came out, there wasn’t a long line of people waiting to buy it in pre-civil-rights Monroeville. “Folks didn’t take much notice until the movie came out,” he says.

“It seems there are a few rough edges between Harper Lee and the town,” I said to the Reverend Thomas Lane Butts, a keen surveyor of souls and a friend of the writer. He considered the matter carefully. “We all have our dark side,” he said finally. “In most of us it remains hidden.”

We are all light and shadow, except, perhaps, the pitch-black soul of Bob Ewell, *Mockingbird*’s villain. Cranky, mean Mrs. Dubose turns out to be brave. Gossipy Miss Stephanie has a good heart. Even Mayella Ewell, the white girl who falsely accuses a black man of rape, plants geraniums in chipped enamel chamber pots, trying to bring beauty to her bleak, shabby world.

We want to believe the dancer is the dance; we think we know the writer from the words, but it’s never that simple. If Harper Lee wants a cordon sanitaire around her, let it be. Best to heed Atticus—Most people are nice when you finally see them—and read that beautiful book. □

WEBSITE EXCLUSIVE View more images of Monroeville and its production of *To Kill a Mockingbird*, get access to resources and study guides on the book, then nominate your own favorite zip code for coverage in the magazine at ngm.com/0601.

Afterword

In an eerie echo of *To Kill a Mockingbird*, Walter “Johnny D” McMillian was convicted in 1987 of murdering an 18-year-old white woman in Monroeville, despite a lack of evidence. McMillian spent seven years on death row until the persistence of a young lawyer, Bryan Stevenson, and a *60 Minutes* story resulted in his exoneration. “I’ve done forgiven the people that lied on me and put me in prison,” McMillian said upon release. “I’m not bitter at all.” He returned to Monroeville, where he runs a junkyard.





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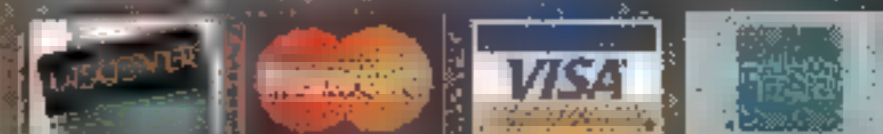
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IRAQI KURDS

Reflections of a City

How do you photograph a parade of mirrors without catching yourself in the reflection? Very carefully. Photographer Ed Kashi took hundreds of pictures to get this shot at the Citadel Frame Shop in Erbil, the capital of Iraqi Kurdistan.

"I loved the multiple layering," says Ed, "but it was a real dance keeping track of several different scenes simultaneously." With Erbil's ancient citadel in the background, the image seemed to capture Kurdistan's dilemma between remembering its past and moving into its future.

Ed kept his camera trained on the scene for minutes at a time, while he propped himself awkwardly on a cinder block to stay out of the frame—a sight that caused many passersby to stop and stare. "I think they thought, he's either really dedicated," Ed says, "or he's a lunatic."

ONLINE PHOTO GALLERY View Web-exclusive images with tips from photographer Ed Kashi at ngm.com/0601.

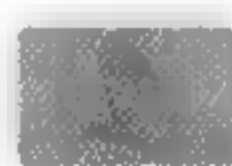
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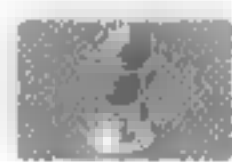
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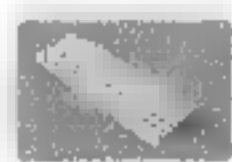
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GRAND CANYON NATIONAL PARK (SEE PAGE 36)

A Photographer's Secrets

"It doesn't take technical expertise to shoot the Grand Canyon—it takes patience to get the right atmospheric and light," says photographer **Michael "Nick" Nichols**. Each image in the story took him about a week to get. Here are some of his favorite spots from which to shoot.

- Paved road
- - Unpaved road
- Trail



1 Toroweap Overlook (see cover and On Assignment images) Famous for sunrises, Toroweap also offers a vantage straight into the canyon and the Colorado River's Lava Falls.

2 Point Sublime (see pages 54-5) Tough to get to (you need four-wheel drive), it's one of the best spots for incoming storms.

3 Granite Rapids (see pages 48-9) Great for a shot of the canyon floor, particularly by moonlight. Accessible by trail or by river (allow at least six days for a raft trip through the canyon).

4 Bright Angel Trail-head (see pages 36-7) Good for images of the canyon after a fresh snow. Roads are plowed in winter to keep the South Rim accessible (but not the North Rim), and the crowds are gone.

5 Cape Royal The place to be at sunset.

6 Desert View Another good spot to shoot sunsets and classic canyon rock formations.

GO THERE Get travel tips at ngm.com/0601.

Scale varies in this perspective. Distance from Grand Canyon Village to North Rim Visitor Center is 10 miles (16 kilometers).

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NG MAPS

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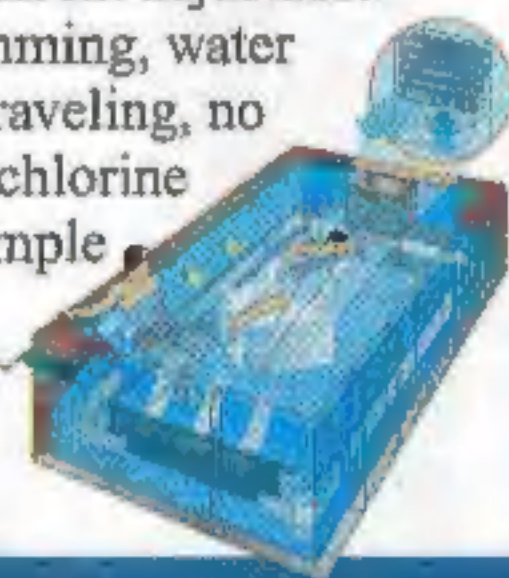
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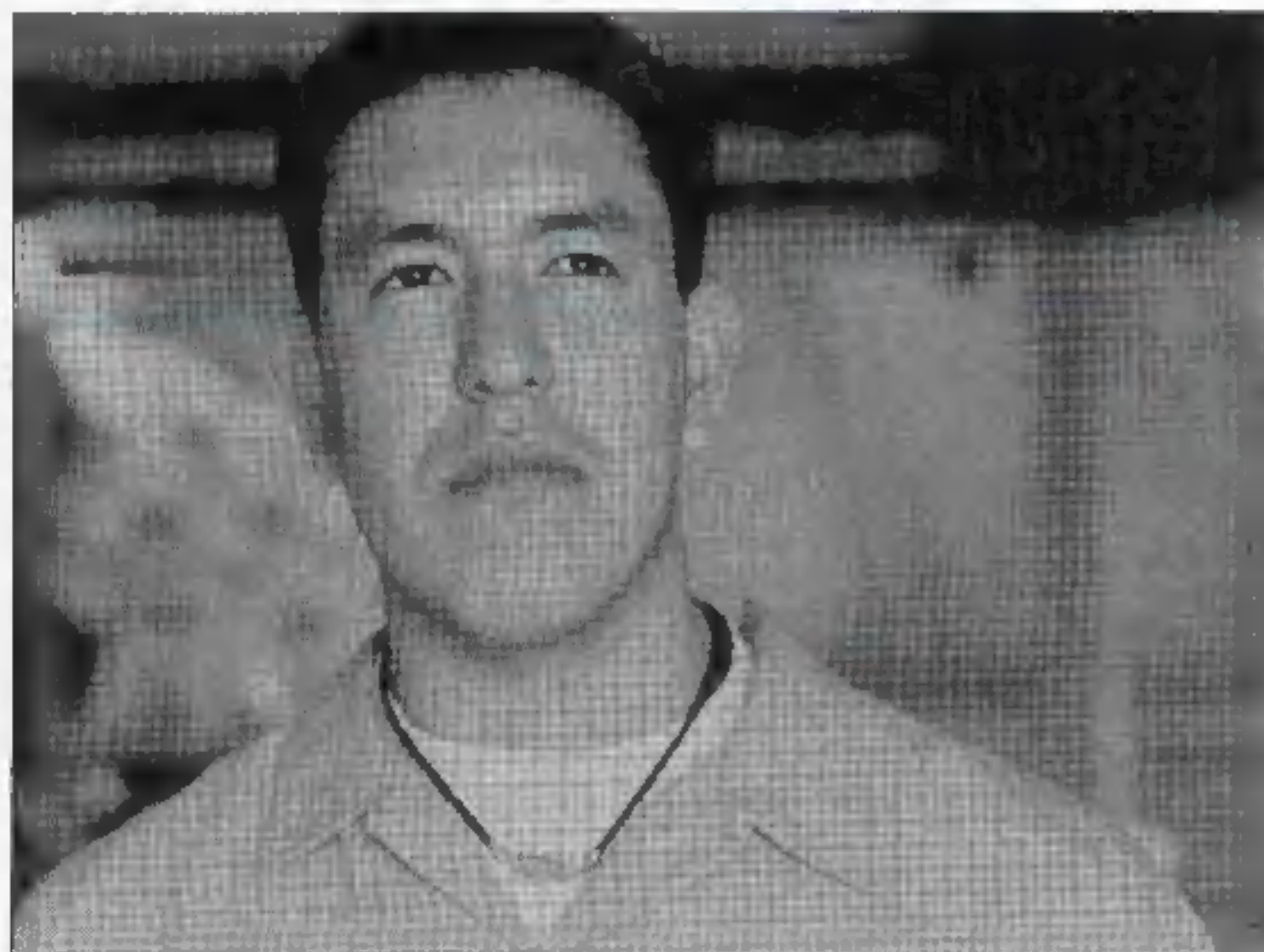


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Flashback

Future admiral Richard Byrd maneuvers an ice raft in Greenland.



ICE HUNTERS

Pole Position

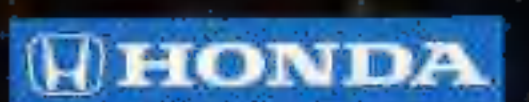
When Navy flier Richard E. Byrd joined Donald MacMillan's 1925 Arctic expedition, he proved he could pilot more than a plane. As encroaching pans of pack ice menaced the explorers' ships, Byrd took to the bergs with a wooden board (above). The presence of polar bears was considered less of a threat. MacMillan explained in his account of the expedition in the November 1925 *GEOGRAPHIC*: "Fresh bear tracks kept the boys interested and a bit excited over the prospect of fine rugs for their dens." —Margaret G. Zackowitz

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